



LLOYD'S REGISTER
OF
BRITISH AND FOREIGN SHIPPING.

RULES
FOR
THE BUILDING AND CLASSIFICATION OF STEAM AND
SAILING VESSELS BUILT OF IRON.

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INDEX

TO

RULES FOR THE BUILDING AND CLASSIFICATION OF STEAM AND SAILING VESSELS BUILT OF IRON.

Section	Page	Section	Page
46. Additional Strength for Vessels from 11 to 16 depths to length	82	— Classification of Vessels—present system, how indicated	49
39. Anchors, number and weight, testing, &c. (see Table No. 22)	75	30. Coal Scuttles, lids how secured	73
12. Angle Iron Stringers, sizes reduced at ends.....	59	27. Cocks on Bulkheads, where fitted and how opened.....	71
43. Awning-decked Vessels	79	22. Collision Bulkheads	68
13. Beams, form and size of (see Table G 3, after page 95).....	59	18. Crutches, where fitted	65
14. ——— spacing of, according to depth of hold	59	29. Deadlights to Skylights	73
14. ——— in Engine and Boiler Rooms (see Sec. 13, par. 4)	59	23. Decks, Iron	69
42 to 45. Beams of Awning Decks, Spar Decks, Poops, Forecastles, Raised Quarter Decks, &c.	77 to 81	23. ——— Wood, thickness of Fastenings, &c. (see Table G 2, after page 95) ...	69
26. Bearers under Engines and Boilers, con- struction of	71	29. Doors in Trunk Bulkheads	73
10. Bilge Keelsons and Stringers in Hold (see also Sec. 14).....	58	24. Double Bottoms	70
34. Bitts, how fitted	74	26. Engine Bearers, construction of, &c. ...	71
39. Boats, number and quality of	75	29. ——— Hatchways, Skylights, &c.	73
26. Boiler Bearers—space, construction, &c.	71	26. ——— Space, Hold Beams of extra strength	71
19. Boss-plates	66	39. Equipment (see Table No. 22).....	75
23. Boundary Planks of Weather Decks ...	69	43. Erections on Awning Decks	79
1. Breadth of Vessels, how measured, &c....	52	42. ——— Spar Decks	77
44. Bridge Houses (see Poops)	80	23. Fastenings of Decks	69
22. Bulkheads	68	7. Floor Plates.....	54
19. Bulwark Plating	66	44. Forecastles	79
5, 7, 8, 20. Butt Straps.....	53 to 55 & 66	6, 8. Frames.....	54 & 55
25. Ceiling, fastening of, &c.	71	41. Frames and Reversed Frames of 3-Decked Vessels	75
35. Cement.....	74	42. Frames and Reversed Frames of Spar- decked Vessels	78
33. Chain Plates.....	74	43. Frames and Reversed Frames of Awning- decked Vessels	79
39. Chains, &c., length and size of (see Table 22).....	75	45. Frames Reversed, Raised Quarter-decked Vessels	81
		6. Frames, Spacing of	54
		5. Garboard Plates, if thicker than re- quired	53

Section	Page	Section	Page
19. Garboard Strakes, shift of, &c.....	65	36. Rudder.....	74
16. Gutter Waterways to Upper Decks	64	5. Rudder Braces, to be forged on Sternpost	54
28. Hatchway Beams, Comings, &c.	72	2. Scantlings' numbers, how obtained	52
18. Hooks at ends of Stringers	65	31. Scuppers and Ports	73
44. Houses, Bridge (<i>see</i> Poops).....	81	19. Sheerstrakes	65
3. Iron, Quality of	53	26. Shaft Tunnel, construction of	71
5. Keel	53	32. Side Lights in Sheerstrake	74
21. — Bar riveting to be doubled	67	29. Skylights	73
5. — Plates, hollow or flat	53	42. Spar-decked Vessels.....	77
10. Keelsons, Bilge, and Hold Stringers ...	58	5. Stem.....	53
9 & 11. Keelsons, middle line, side, &c....	56 to 58	12, 14, 16. Stringers	58, 59, & 63
21. Laps of outside plating	67	— Survey Special No. 1, No. 2, and No. 3	50 & 89
1. Length of Vessels for Scantlings, how taken	52	39. Testing of Anchors and Chain Cables ...	75
20–22. Lining Pieces	67 & 68	41. Three-decked vessels	76
39. Machinery included in equipment.....	75	17. Tie-plates	64
— Masts, Topmasts, Bowsprit, Yards, &c., suggested Scantlings of Iron (<i>see</i> Tables, after page 95).		29. Trunk Bulkheads round Engine Hatches between Decks.....	73
28. Mastholes, framing of, &c.	72	27. Valves on Bulkheads, and for inlet of water to engines	71
40. Midship Sections, &c., to be forwarded with Reports	76	32. Ventilators to upper deck and through topsides	74
39. Numbers for Equipment (<i>see also</i> foot-notes to Table 22)	75	Vessels classed 100A, 90A, 80A, &c., periodical Survey of.....	49
2. — for Scantlings, how obtained... ..	52	— A, for river or similar purposes only	49
23. Openings in Iron Decks to be compensated for	70	— A, A, A, and A for terms of years under previous Rules	91
14. Panting, to prevent	62	— Periodical Survey of	92
15. Pillars	62	— *A1	95
28. Plating in way of long Hatchways	72	47. — not Surveyed while building ...	89
19. Plating, outside	65	46. — of extreme proportions	82
44. Poops, Forecastles, &c., Scantlings for... ..	80	11. Wash-plates, thickness of.....	58
31. Ports and Scuppers, number of, how fitted, &c.....	73	7. Watercourses in floor-plates, &c.	55
5. Posts, Stern and Propeller	53	16. Waterways—Gutter.....	64
27 & 38. Pumps, and Stop-cocks to	71 & 75	37. Windlass	74
3. Quality of Iron.....	53	4. Workmanship	53
21. — Rivets	68		
45. Raised Quarter Decks	81		
6 & 21. Rivets, riveting and punching.....	54 & 67		

RULES

FOR

THE BUILDING AND CLASSIFICATION OF STEAM AND SAILING VESSELS BUILT OF IRON.

All IRON vessels will be classed Δ with a Numeral prefixed, so long as, on careful annual and periodical Special Surveys, they are found to be in a fit and efficient condition to carry dry and perishable cargoes to and from all parts of the world.

100 Δ , 90 Δ , and 80 Δ , will denote vessels that have been built in accordance with, or equal to, the Rules, and Tables G 1, G 2, G 3, and G 4. Deviations from the Rules will be allowed, provided that a sketch of the midship section, plans, &c., in each case, showing the proposed scantlings and arrangements, be first submitted through the resident Surveyors, and approved by the Committee; and, that the vessels be built in accordance with the approved plans, under the Survey of the Surveyors of this Society.*

Vessels which do not fulfil all the requirements for the 100 Δ class, but which are superior to those built on the 90 Δ scale, may, if the Committee approve, be classed 95 Δ ; those not equal to the 90 Δ , but superior to the 80 Δ , may be classed 85 Δ ; and those which in some respects are deficient of the requirements of the 80 Δ scale, but fit for the Δ class, may be classed 75 Δ .

Vessels not considered eligible for either of the foregoing numerals may, if found fit, be classed Δ for river or similar purposes only.

N.B.—It is to be distinctly understood that the numerals prefixed to the letter Δ do not signify terms of years, but are intended for the purpose of comparison only; the Δ character assigned being for an indefinite period, subject to annual and periodical Surveys as follows.

All vessels to be submitted to occasional or annual Surveys when practicable. To entitle them to retain their characters in the Register Book, the following Special Surveys must be held periodically. At the time of any survey, the comparative numeral will depend on the thickness of the plating and angle iron, and the general condition of the vessel.†

* In vessels building, or to be built, under contract for classification, deviations from the Rules will not be allowed by the Committee, unless the Builder shall previously obtain the sanction of the Owner.

† *Expunging or withdrawal of character.—The eleventh, twelfth, and thirteenth Columns left blank, indicate that the Vessel has never been Classed in the Register Book. Three dots ... in Column 12 indicate that the Vessel was at one time Classed by this Society, but that the Class has been withdrawn at owner's request. A black line with date under it in Column 13 indicates that, at that date, the Vessel, from reported defects, was not entitled to a Character in the Register Book. A red line with date under it in this Column indicates that the Class was withdrawn from non-compliance, at that date, with the Society's Rules.*

‡ **Survey No. 1.**—The vessel to be placed on blocks of sufficient height, in a dry dock, or on ways; the limber boards and ceiling equal to one strake fore and aft on each side removed,§ and both surfaces of outside plating exposed.*

If the vessel has a double bottom the same must be tested by a head of water to the height of the light water-line to test its efficiency.

‡ **Survey No. 2.**—The vessel to be placed on blocks of sufficient height, in a dry dock, or on ways, the limber boards and ceiling equal to *three* strakes fore and aft on each side removed,§ and both surfaces of outside plating exposed.*

The windlass at this and all subsequent alternate special surveys to be unhung, where necessary, and its wood linings sufficiently stripped, for examination. The chain cables are also to be ranged for inspection.

After a vessel has passed No. 3 Survey, in addition to the survey prescribed for No. 2 when that survey becomes due, ceiling should be lifted at other parts of the vessel where deemed necessary by the Surveyors to enable them to satisfy themselves as to the condition of the vessel.

If the vessel has a double bottom the same must be tested by a head of water to the height of the light water-line to test its efficiency.

‡ **Survey No. 3.**—TO BE HELD BY TWO SURVEYORS, ONE TO BE AN EXCLUSIVE OFFICER OF THE SOCIETY.—The vessel to be placed on blocks of sufficient height, in a dry dock, or on ways; proper stages to be made, and the hold to be cleared, all the close ceiling in the hold to be removed, so that the rivets, plates of keel, and flat of bottom, may be thoroughly examined; coal bunkers of steam vessels to be cleared, the whole of the frames, stringers, hooks, floor-plates, keelsons, engine and boiler bearers, ends of beams, water-tight bulkheads, rivets, and inner surface of the plating, to be exposed; all oxidation to be removed by being cut or beaten off the several parts above named, also from the outside plating, rivets, keel, stem, sternpost, and rudder; the planksheers and waterways, if of wood, to be scraped bright. When the vessel is thus prepared, the Surveyors, if they deem necessary, are to ascertain the thickness of the plating by having holes drilled.*

Such parts as may be found defective, or less than three-fourths of the required substance by Rule, are to be removed, and replaced with proper materials, equal in substance and quality to the original construction.† The planksheers, waterways, flat of decks, and their fastenings, are also to be examined, and made good where necessary.‡

If the vessel has a double bottom the same must be tested by a head of water to the height of the light water-line to test its efficiency.

* In cases where the inner surface of the bottom plating is coated with cement, or asphalte, if the coating be carefully inspected and tested, by beating or chipping, and found sound and adhering satisfactorily to the iron, its removal may be dispensed with.

† Where the deterioration in thickness is widespread, and it is not deemed advisable by the owner to renew the material, on a detailed report being made by the resident Surveyor, the class of the vessel will be reconsidered.

‡ To facilitate the arrangements of Owners, a portion only of the requirements of the foregoing special surveys may be complied with at the expiration of the time specified, provided that the whole of the survey be completed within twelve months. The Surveyors in such cases are to give the Owners, or their agents, written notice of the parts not surveyed, and are also to report the same to the Committee.

§ In the case of vessels fitted with double ceiling, application may be made to the Committee if any relaxation be required.

Upper decks must be renewed when reduced in thickness as follows, viz.:—When a deck originally 4 inches thick is worn to 3 inches, $3\frac{1}{2}$ inches to $2\frac{3}{4}$ inches, 3 inches to $2\frac{1}{2}$ inches.

Every vessel which has been classed from 100A to 90A, inclusive, must be submitted to a special periodical survey every four years;—the first according to No. 1; the second according to No. 2; the third according to No. 3; and afterwards according to Nos. 1, 2, and 3, consecutively, at intervals of four years.*

Vessels classed 85A and under, must be subjected to a special survey every *three* years, as per Nos. 1, 2, 3, and afterwards as per Nos. 1, 2, and 3 consecutively.

In all vessels classed 90A and above, No. 3 Survey must be complied with before the expiration of *thirteen* years from the date of build or the previous No. 3 Survey. In vessels classed 85A and under, No. 3 Survey must be complied with before the expiration of *ten* years from the date of build or the previous No. 3 Survey.

Vessels which have undergone either of the foregoing examinations, will be noted in the Register Book, thus *s.s. No. 1—74*, *s.s. No. 2—74*, *s.s. No. 3—74*, indicating the special survey and date thereof; and any vessel having passed the time when the foregoing surveys have become due, and not being marked as above in the Register Book, will be liable to have her character suspended.

Whenever the engines or boilers are taken out, the bearers, with the floor-plates, keelsons, rivets, &c., under them, may, at the request of the Owners, be surveyed in anticipation of the above Rule; and whenever the bottom plating is to be cemented, a survey is to be held prior to the cement being laid.

SURVEYS WHILE BUILDING.

SPECIAL SURVEY.

The Surveyors are to examine during the progress of a vessel, the materials and workmanship, from the laying of the keel to her completion; and to point out as early as possible anything that may be objectionable.

ORDINARY SURVEY.

- 1st. On the several parts of the frame, when in place complete, and before any plating is wrought.
- 2nd. On the plating, during the progress of riveting.
- 3rd. When the beams are in and fastened, before the decks are laid.
- 4th. When the vessel is complete, but before the plating is finally coated or cemented.
- 5th and last. After the vessel is launched and equipped.

* Should a ship at any time be submitted to Special Survey No. 3 before being 12 years old, the subsequent Special Surveys may be Nos. 1, 2, and 3, consecutively, dating from the completion of such No. 3 Survey.

RULES FOR THE BUILDING OF IRON VESSELS.

Section 1. The scantlings given in Tables G 1, G 2, and G 3, are intended for vessels the length of which does not exceed *eleven times* their depth, *from the top of keel*. Where this proportion is exceeded, *see* Sect. 46.

For proportions of breadth to length *see* Table G 4.

The measurements for regulating the proportions are to be taken as follows:—

LENGTH.

The length to be measured from the after part of the stem to the fore part of the stern-post, on the range of the upper deck beams, in one, two, and three-decked and Spar-decked vessels, but on the range of main deck beams in Awning-decked vessels.

In vessels where the stem forms a cutwater, the length is to be measured from the place where the upper deck beam line would intersect the after edge of stem if it were produced in the same direction as the part below the cutwater.

BREADTH.

The breadth is in all cases to be the greatest moulded breadth of the vessel.

DEPTH.

The depth in one and two-decked vessels is to be taken from the upper part of the keel to the top of the upper deck beam amidships. In Spar-decked vessels and Awning-decked vessels, the depth is to be taken from the upper part of the keel to the top of the main deck beam amidships. For three-decked vessels *see* Section 41.

SCANTLINGS.

Section 2. The scantlings of the frames, reversed frames, and floor-plates, the thickness of bulkheads and the diameter of pillars in Table G 1, are regulated by numbers, which are produced as follows:—

For one and two-decked vessels.—The number is the sum of the measurements in feet, arising from the addition of the half-moulded breadth of the vessel amidships, the depth from the upper part of the keel to the top of the upper deck beams, and the girth of the half midship frame section of the vessel, measured from the centre line at top of keel to the upper deck stringer plate.

For three-decked vessels.—The number is produced by the deduction of seven feet from the sum of the measurements taken to the top of the *upper* deck beams; *see* Sect. 41.

For spar-decked vessels and awning-decked vessels.—The number is the sum of the measurements in feet, taken to the top of the main deck beam, as described for vessels having one or two decks.

The scantlings of the keel, stem, stern-posts, keelson and stringer plates, the thickness of the outside plating and deck; also the scantlings of the angle irons on beam stringer plates, and keelson and stringer angle irons in hold, as in Tables G 1, G 2, and G 4, are governed by the number obtained by multiplying that which regulates the size of the frames, &c., by the length of the vessel.

QUALITY OF IRON.

Section 3. The whole of the iron to be of a good malleable quality, to be subjected to tests at the discretion of the Surveyors. Brittle or inferior material to be rejected.

All plate, beam, and angle iron to be legibly stamped in two places with the manufacturer's name or trade mark, and the place where made, which is also to be stated in the report of survey.

WORKMANSHIP.

Section 4. The workmanship to be well executed, and submitted to the closest inspection, and amended where necessary before coating or painting: it is not intended to prevent the coating of the plates *inside* in the way of the frames.

KEEL, STEM, STERN, AND PROPELLER POSTS.

Section 5. The keel, stem, stern, and propeller posts are to be either scarphed or welded together, and to be in size according to Table G 1; if scarphed, the length of scarphs to be nine times the thickness given in the table for keels; and the rivet holes required in the *thin* ends of them are recommended to be drilled after the scarphs are fitted.

Where the garboard strakes are thicker than required by the Rules, the thickness of the keel may be proportionately reduced.

Where the keel and keelsons are made of several thicknesses of plates, the plates that form the keel to be in thickness, taken together, the same as is required for a solid keel, as per Table G 1; and the butts of the several plates of which the keel is formed to be carefully shifted from each other.

When **Hollow or flat keel plates** are adopted, their breadth must be the same as given for the garboard strakes, and their thickness not less than once and a third that prescribed for those strakes, for three-fifths the vessel's length amidships. The plates before and abaft this length may be gradually reduced to the thickness of the garboard strakes amidships; and the strake of plating on each side adjoining the flat keel plates to be of the thickness required for the garboard strakes in Table G 1.

Where flat plate keels are used, intercostal keelson plates, or centre through-plates, must be fitted close down on the keel, and connected to it by double angle irons of the dimensions given for keelson angle irons in Table G 2, riveted all fore and aft to the keel and keelson. See also Section 9, paragraph 6.

The butt-straps of flat keel plates are to be one-sixteenth of an inch thicker than the plates they connect, and treble riveted.

The stem at its lower part is to be the same moulding as the keel, and attached to it by a scarph of the same length as the keel scarph; it may be gradually reduced from the height of the load-line, to its head, where it may be three-fourths of the sectional area given in Table G 1.

The stern and propeller posts, and after end of keel, for single screw propelled vessels, to be double the thickness, or twice the sectional area, prescribed for sternposts in Table G 1, the portion adjoining the keel to be tapered fair into it. In a sailing vessel, or paddle steamer, the sternpost may be reduced from the lower

part of the rudder trunk to its head, where it may be three-fourths of the sectional area given in the Table; and in a steam vessel having a propeller frame, it may be reduced at the head to the size given in the Table.

The portion of the forging of the stern frame, forming part of the keel, is to extend sufficiently forward for the after end of its scarph *in sailing vessels and paddle steamers* to be at least once and a half the frame space before the sternpost, and *in screw propelled vessels*, at least twice and a half the frame space before the propeller post.

The rudder braces are recommended to be forged on to the sternpost.

FRAMES.

Section 6. The frames to be of the dimensions set forth in Table G 1; to be in as great lengths as possible, fitted close on to the upper edge of the keel; and at the extreme ends of the vessel the lower parts of the frames opposite to each other are to be lapped and riveted together; and in all vessels to extend to the gunwale. Where either raised quarter decks, poops, or forecastles, are constructed, the frames are to extend to their deck stringers respectively, except when constructed of a rounded form at the gunwale; they may then terminate at the lower part of the curve.

When the frames are butted on the keel (except when centre through-plate keels are adopted) they are to have not less than three feet lengths of corresponding angle iron, fitted back to back, to cover and support the butts and receive the plating for at least three-fourths the vessel's length amidships. Similar pieces of angle iron are to be fitted, if the frames are butted elsewhere.

The rivet holes to be punched through from the faying surfaces of the frames, and they are not to be punched at the turn of the bilge until the frames are bent to the required shape; the holes in way of the lands of the plating are to be drilled after the plating is wrought.

The spacing of the frames from centre to centre to range from twenty to twenty-four inches, according to the size of the vessel, *see* Table G 1.

FLOOR-PLATES.

Section 7. The floor-plates to be in size at the middle line according to Table G 1, for half the length amidships, excepting under the engines and boilers in steam vessels, where they must be one-sixteenth of an inch thicker, when the thickness prescribed in Table G 1 is nine-sixteenths of an inch or under. They are to be moulded not less than one-half their midship depth* at a distance of three-quarters the half breadth of the vessel set out from the middle line on the run of the frame, and not less at their extreme ends than the moulding of the frames; and they are to extend in a fair curve well up the bilges, in no case terminating lower at the outside of the frame than a perpendicular height of twice the midship depth of floor above the top of keel. The ends of the floors to maintain the height prescribed, for one quarter of the vessel's length amidships, they may then be gradually lowered forward and aft until the upper edges of the floor-plates are level (this place to be determined by the form of the vessel), from which to her ends they are to be gradually

* In vessels of unusual form, in which it may be considered desirable to depart from this condition, the approval of the Committee must be obtained thereto.

increased in depth, so as to efficiently connect her sides; the upper parts of the floors forward and aft are to be high enough to give ample room between the reversed frames, on each side of the vessel, for fitting the keelson angle irons.

The thickness of the floor-plates for half the vessel's length amidships to be as given in Table; but for one quarter of her length at each end, they may be reduced in thickness one-sixteenth of an inch when the plates amidships are six-sixteenths and above; and when the plates amidships are nine-sixteenths in thickness, and above, they may be reduced one-sixteenth of an inch for an eighth of the vessel's length before and abaft the half-length amidships, and the remainder may be two-sixteenths of an inch less in thickness than the midship floors.

A floor-plate to be fitted and riveted to every frame, and to be extended across the middle line, except where a vertical centre-plate is adopted, in which case the floor-plates are to be efficiently connected to it on each side by double vertical angle irons of not less size than the reversed frames.

When floors are made in two lengths, the butts are to be well fitted, and to have double butt-straps treble riveted; or, the floor-plates may be lapped and treble riveted.

Floor-plates to which the bulkheads are attached must be deeper than the adjacent floor-plates, to admit of the bulkheads being riveted to them above the reversed angle irons.

WATERCOURSES are to be formed above the frames through all the floor-plates, on each side of the middle line, also at the lower turn of the bilges in vessels of full form, as well as through the vertical centre-plate, and intercostal keelsons, when such keelsons are adopted, so as to allow water to reach the pumps freely.

Transom-plates are to be fitted and connected to the frames, and to the sternpost where practicable, so as to efficiently support the counter.

REVERSED ANGLE IRONS ON FRAMES.

Section 8. Reversed angle irons on frames to be in size as per Table G 1.

Vessels where the number for regulating the size of the frame is below 45, to have reversed angle irons riveted to every frame and floor-plate, extending across the middle line to the upper part of the bilges.

Vessels where the number, as per Rule, is 45 and below 57, to have reversed angle irons riveted to every alternate frame and floor-plate, extending across the middle line to the upper part of the double angle iron stringer above bilges, and on the remaining floor-plates and frames to the gunwale; or, if the vessel is of a depth to require hold beams, the reversed angle irons are to extend to the upper part of the hold beam stringer angle iron and gunwale alternately.

All vessels, except those having an awning-deck, where the number, as per Rule, is 57 and upwards, to have reversed angle irons on every frame, extending alternately to the upper deck stringer plate, and top of angle iron on stringer plate next below it. In awning-decked vessels they are to extend alternately to the upper part of the main deck stringer angle iron, and top of angle iron of stringer plate next below it.

In *sailing vessels* where the number, as per Rule, is 75 and upwards, the reversed frames are to extend to the gunwale on every frame.

Double reversed angle irons to be fitted on every floor, extending from bilge to bilge, in the engine and

boiler spaces of steam vessels; and where the vessel is of 15 feet depth or above from the hold beams, they are to extend sufficiently high to admit of the stringer at upper part of bilge being connected to them. Short double reversed angle irons are also to be fitted on all frames in way of the keelsons and stringers in hold.

The butts of reversed angle irons, excepting those at middle line, to be secured with butt straps, having not less than two rivets on each side of the butt.

The rivets for securing the reversed angle iron to the frames and floor-plates to be in diameter in proportion to the greatest thickness of angle, or plate iron, through which they pass, as specified in Table G 1, and to be spaced eight times their diameter, from centre to centre.

MIDDLE LINE KEELSONS.

MIDDLE LINE SINGLE PLATE KEELSON.

Section 9. The middle line keelson, if of single plate, and standing above the floor-plates, to be of the size prescribed in Table G 2, and to have angle irons, of the dimensions given in the same Table, fitted and riveted on its upper and lower edges. In addition there is to be a rider plate, on the top of the keelson plate, extending over *three-fourths* of the length of the vessel amidships, riveted to the angle irons, the breadth of which is to be equal to the sum of the two broad flanges of the keelson angle irons together with the thickness of the centre plate it covers; the thickness of the rider plate not to be less than prescribed in Table G 2. The butts of the plates and angle irons forming this keelson to be properly shifted, and to be efficiently butt strapped.

The butts of the vertical plate to be secured with double butt-straps, each not less than two-thirds of the thickness of the plates they connect, and to be treble riveted; the butt-straps of the rider plate to be fitted on the upper side, and to be treble riveted; the butt straps of the angle irons to be of sufficient length to have not less than three rivets properly arranged on each side of the butt.

MIDDLE LINE BOX KEELSON.

If a box keelson be adopted, it is to be formed of plates, properly shifted, of the thickness given in Table G 2, with a foundation plate; the depth to be the same as that prescribed for single plate keelsons; the angle irons to be of the size given in Table G 2. The box is to maintain its depth for half the vessel's length amidships, it may then be gradually reduced to two-thirds of the same at the extreme ends.

MIDDLE LINE INTERCOSTAL KEELSON.

If a middle line intercostal keelson be adopted, the plates are to be of the thickness prescribed in Table G 2, and riveted to vertical angle irons of not less size than the reversed frames, to be fitted and attached to all floor-plates; the intercostal plates to extend from the keel to the top of the floors, and to be fitted close to them. A bulb plate at least two inches deeper than required for the main deck beams, is to be let down below the top of the floors, between the reversed angle irons, sufficiently for the intercostal plates to be riveted thereto, and the bulb to be fitted between, and riveted to, two longitudinal angle irons on the floors, extending all fore and aft, of the size given for keelson angle irons in Table G 2; or, the letting down of the bulb plate may be dispensed with, if the intercostal plates are extended to the upper edge of the longitudinal angle irons.

When intercostal keelsons are adopted with hanging keels, in vessels where the number for plating is 16,600 and under 21,700, instead of a bulb plate there is to be a centre vertical plate let down and attached to the intercostal plates below the top of floors, having double continuous angle irons at top and bottom, and a rider plate on its upper edge, of the sizes given in Table G 2; the vertical plate and the rider plate are to be of the thickness required for stringer plates in upper line of Table G 4, and the depth above the floors to be sufficient to admit of the angle irons being properly fitted. When the number is 21,700 and above, the vertical plate and the rider plate are to be one-sixteenth of an inch thicker than that given for stringer plates as above, and its depth above the floors to be not less than three-fourths of that given in Table G 2 for middle line keelsons.

Where **Flat plate keels** are used, intercostal keelson plates, or centre through-plates, must be fitted close down on the keel, and connected to it by double angle irons of the dimensions given for keelson angle irons in Table G 2, riveted all fore and aft to the keel and keelson. In vessels where the number for plating is 14,300 and under 18,700, instead of a bulb plate, there is to be a centre vertical plate let down and attached to the intercostal plates below the top of floors, having double continuous angle irons at top and bottom, and a rider plate on its upper edge; the vertical plate and the rider plate are to be not less in thickness than that given in the upper line of Table G 4 for stringer plates, and the depth above the floors to be sufficient to admit of the angle irons being properly fitted. Where the number is 18,700 and above, the vertical plate is to be one-sixteenth of an inch greater than the above thickness, and its depth above the floors to be not less than three-fourths of that given in Table G 2 for middle line keelsons.

CENTRE THROUGH-PLATE KEEL AND KEELSON.

If the middle line keelson be formed of a centre through-plate, extending from the lower edge of the keel to the top of the floors, it must be two-sixteenths of an inch thicker than that required in Table G 2 for intercostal keelsons. To strengthen the floor-plates transversely at their intersection at the middle line, in addition to the double vertical angle irons riveted to their ends and to the centre plate keelson, there is to be a flat keelson plate, of the same thickness as, and not less than three-fourths the breadth of, the garboard strakes in Table G 1, riveted to double reversed angle irons on the upper edge of floors, and to two fore and aft angle irons on the upper edge of the centre through-plate keelson; and where the number for plating is 16,600, and under 26,400, there is to be a bulb plate of the size of the main deck beams, fitted between, and riveted to, two longitudinal angle irons of the size for keelson angle irons in Table G 2, connected to flat plate keelsons and double reverse bars on top of floors. But should the centre through-plate keelson be extended above the upper edge of the floors, then it is to be connected by two fore and aft angle irons, of the size given in Table G 2, to two flat plates, one on each side of the middle line, to be one-sixteenth of an inch thicker than that given for intercostal plates, and one-third the breadth of the garboard strakes, to be well riveted to the double reversed angle irons on the upper edge of the floors. Where the number is 26,400 and above, the centre through-plate keelson is to extend sufficiently high above the floor plates to take two pairs of double angle irons of the size given for keelson angle irons, and there is to be a rider plate fitted on the top of the thickness of the keelson plate.

In all cases the middle line keelson is to be extended as far forward and aft as practicable.

BILGE KEELSONS, AND STRINGERS IN HOLD.

Section 10. All vessels to have bilge keelsons, extending all fore and aft, and placed at the lower turn of the bilges, formed of double angle irons fitted back to back, of the size given in Table G 2.

If the vessel has but a single tier of beams and her number in Table G 2 is under 7,200, a side stringer, formed of the same size angle irons, is to be fitted about midway between the bilges and upper deck, extending all fore and aft.

Where the number is 7,200 and above, and the vessel is under 14 feet depth of hold, two double angle iron stringers are to be fitted on each side between the bilge keelsons and the deck beams, the upper pair to extend all fore and aft, the lower pair to extend over half the vessel's length amidships, to be riveted back to back and to double reversed angle iron on the frames; the size of them not to be less than those used for the middle line keelson.

For stringers in hold, *see also* Sect. 14.

SIDE KEELSONS.

Section 11. In vessels where the number in Table G 2 is 13,100, and under 15,500, a double angle iron keelson is to be fitted on each side, as far forward and aft as practicable, and to be placed about midway between the middle line and bilge keelsons.

Where the number is 15,500, and upwards, intercostal plates are to be fitted on each side, as far forward and aft between the floors as practicable, and to be placed about midway between the middle line and bilge keelsons; these plates are to be fitted close to the floors, and to be attached to the outside plating with an angle iron of the size of the reversed frames; they are to extend to the top of the floors, and longitudinal plates, in long lengths of the same thickness as the intercostal plates, are to be let down and riveted to them. These plates are to be fitted between, and riveted to, two longitudinal angle irons of the size given for keelson angle irons; or, the longitudinal plates may be dispensed with if the intercostal plates are extended to the upper edge of the longitudinal angle irons and riveted to them.

Side-intercostal plates or side keelsons need not be fitted in the range of double bottoms; but where partial double bottoms are fitted, these keelsons are to extend into, or scarp the double bottom not less than three spaces of frames, and to be connected to the longitudinal girders where practicable.

Vessels not being of a size to require side intercostal keelson plates are to have washplates, of the thickness given for bulkheads in Table G 1, fitted between the middle line and bilge keelsons, for not less than half the vessel's length amidships.

DETAILS RELATING TO KEELSONS AND STRINGERS.

Section 12. Where bulb iron is used for keelsons or stringers, the joints to be overlapped and riveted, or otherwise efficiently connected; if overlapped, the length of lap must not be less than twice the depth of the bulb plate; iron of other form than bulb may be used for them, if of equal strength.

All angle irons for keelsons and stringers are to be in long lengths, properly shifted; and wherever butted to be connected with angle or plate iron, not less than two feet long, fitted in the throat of them, properly riveted to each flange. The thickness of the connecting plates not to be less than the thickness of the angle irons they connect.

In all cases the middle line, side, and bilge keelsons, and, where practicable, the stringers, are to be carried fore and aft, continuously through the bulkheads, the latter being made watertight around them; and where such parts of the ship are necessarily separated, the longitudinal strength is to be efficiently maintained, to the satisfaction of the Surveyors.

All middle line and intercostal keelson plates may be reduced in thickness forward and aft, to the same extent as allowed in the floor-plates; or the former may be proportionately reduced in depth at the ends of the vessel.

All keelson and stringer angle irons may be reduced one-sixteenth of an inch in thickness, when above seven-sixteenths of an inch amidships, for one-fifth the vessel's length at each end.

BEAMS.

Section 13. Beams are to be of the form and size given in Table G 3; or, they may be composed of any other approved form, equal in strength.

All beams to be well and efficiently connected or riveted to the frames, with bracket ends or knee-plates; each arm of knee-plates not to be less in length than twice and a half the depth of beams, and to be in thickness equal to the beams; and not more than two holes in each beam arm to be punched before the beam is in place.

The beams of the various decks are to be placed over each other.

The size of all beams, with the exception of those of awning decks, poops, and forecastles, which are not less in length than three-fourths of the length of the midship beam, may be in proportion to their length, as given in Table G 3; all other beams must not be less than three-fourths the depth and thickness of the midship beam, excepting those at ends of hatchways exceeding in length four spaces of frames, also mast, and pall bitt beams, and beams under deck houses and the heel of bowsprit, which must not be less in size than the midship beam. Those in engine and boiler spaces at each deck to be of extra strength.

SPACING OF BEAMS, AND STRINGERS IN HOLD.

Section 14. The spacing of beams, or the arrangement of stringers substituted for beams, is to be regulated by the *depth amidships*,* measured from the upper part of the floor-plates to the top of the upper deck beams, except in awning-decked vessels, when it is to be measured from the top of the floor-plates to the top of the main deck beams amidships. *See also* Section 10, Paragraphs 2 and 3.

All upper deck beams and the middle deck beams of three-decked ships, and the main deck beams of spar and awning-decked ships, to be fastened to alternate frames.

All *Vessels under 12 feet in depth* are to have a double angle iron stringer extending all fore and aft, about midway between bilge keelson and deck beams, riveted at every frame to the reversed frames, or to single lug pieces of the size of the frames.

All *Vessels of 12 and under 13 feet in depth* to have, in addition to the foregoing, bulb iron of the size required for their deck beams, riveted between the continuous double angle iron stringer for three-fifths the vessel's length amidships; or the bulb iron may be dispensed with, provided that, in lieu thereof, intercostal plates in long lengths be fitted between the double angle iron stringer, and attached by single angle iron to the outside plating.

All *Vessels of 13 and under 14 feet in depth* to have, instead of the bulb iron, as described above, a plate

* For depth under raised decks *see* Section 45.

not less than 12 inches wide and $\frac{7}{16}$ thick, with double angle irons fitted on the inner edge the size of the keelson angle irons, and extending all fore and aft.

All Vessels of 14 feet depth and above to have a double angle iron stringer of the size given in Table G 2, extending all fore and aft at the upper turn of the bilge on each side.

All Vessels of 14 and under 15 feet in depth, to have hold beams of extra strength, as given in Table G 3, fastened to every tenth frame, with a stringer plate of the size given in Table G 4 for hold beam stringers, attached to the plating and supported by brackets at every alternate frame between the beams, and secured to the beams by efficient gusset plates.

All Vessels of 15 and under 16 feet in depth, to have hold beams of extra strength, as given in Table G 3, fastened to every tenth frame, with a stringer plate on them attached to the side plating of the size given in Section 16, and to have at each beam end an efficient gusset plate riveted to the beam and stringer plate. On the inner edge of the stringer plate, between the beams, an angle iron is to be fitted, of the size given for keelson angle irons in Table G 2, with its deep flange vertical, and covering the ends of the bracket plates.

All Vessels of 16 and under 17 feet in depth, to have hold or lower deck beams fastened to every second and fourth frame alternately, or they may have hold beams of extra strength, as given in Table G 3, fastened to every tenth frame, with an angle iron on the inner edge of the stringer plate, and gusset plates at the beam ends, as in the preceding case, or, they may be spaced wider, not exceeding *twelve* frame spaces, provided double angle irons $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$ be fitted on the inner edge of the stringer plate, with a face plate on them $\frac{7}{16}$ of an inch in thickness.

All Vessels of 17 and under 18 feet in depth, to have hold or lower deck beams fastened to every second and fourth frame alternately; or, they may have hold beams as described in the foregoing paragraph, fastened to every tenth frame with an angle iron on the inner edge of the stringer plate and gusset plates at the beam ends as in the preceding case; or, these beams may be *twelve* frame spaces apart, provided double angle irons $4 \times 3\frac{1}{2} \times \frac{7}{16}$ be fitted on the inner edge of stringer plate with their deep flange vertical, and with a face plate $\frac{8}{16}$ of an inch in thickness.

All Vessels of 18 and under 22 feet in depth, to have hold or lower deck beams fastened to every alternate frame; or if hold beams of extra strength as given in Table G 3 be fitted, they may be fastened to every eighth frame, provided an angle iron of the size given for keelson angle irons in Table G 2, be fitted on the inner edge of the stringer plate and gusset plates, as in the previous case. Or, these beams may be spaced wider, not exceeding *twelve* frame spaces, provided double angle irons $4 \times 4 \times \frac{8}{16}$, and a face plate $\frac{9}{16}$ of an inch in thickness be fitted on the inner edge of the stringer plate, with gusset plates at the beam ends.

SAILING VESSELS of 22 and under 24 feet in depth, from the upper part of the upper deck beams, or of 14 and under 16 feet from the upper part of the hold or lower deck beams to the top of the floors, to have the lower deck beams fitted to every alternate frame, and to have two double angle iron stringers extending fore and aft, between the bilge keelson and hold or lower deck beams, on each side.

SAILING VESSELS of 24 and under 25 feet in depth from the upper deck, or 16 and under 17 feet from top of lower deck beams, to have the lower deck beams fitted to every alternate frame, and to have, in addition to the above, bulb plates of the size of the hold beams fitted and riveted between each of the two side stringers in lower hold on both sides, to extend all fore and aft at the upper stringer, and for one-half the vessel's length amidships at the lower stringer.

SAILING VESSELS of 25 and under 26 feet in depth from upper deck, or of 17 and under 18 feet in depth from top of lower deck beams, are to have the lower deck beams fitted to every alternate frame, and to have orlop stringer plates of the dimensions required for hold beam stringer plates in Table G 4 fitted and attached to the outside plating and reversed frames by angle irons of the size given in Table G 2. These stringers must be supported by bracket plates riveted to them, and to alternate frames; and upon the inner edge of the stringer plate an angle of the size of keelson angle irons, as per Table G 2, is to be fitted and riveted, so that its vertical flange may cover the ends of the bracket plates.

SAILING VESSELS of 26 feet in depth or above from the upper deck, or of 18 feet or above from the top of lower deck beams, to have the lower deck beams fitted to every alternate frame, and to have orlop beams of the size given on Table G 3 for "hold beams of extra strength" fitted to every tenth frame, or these beams may be twelve frame spaces apart, provided double angle irons, $4 \times 3\frac{1}{2} \times \frac{7}{16}$, be fitted on the inner edge of the stringer plate with their deep flange vertical, and with a face plate $\frac{8}{16}$ of an inch in thickness.

STEAM VESSELS of 22 and under 24 feet in depth from the upper part of the upper deck beams, or of 15 and under 16 feet from the upper part of the lower deck beams to the top of the floors, to have the lower deck beams fitted to every alternate frame, and to have hold beams of extra strength, as given in Table G 3, fastened to every twelfth frame, with a stringer plate on them attached to the side plating, of the size given in Table G 4 for hold beam stringer plates; and to have at each beam end an efficient gusset plate riveted to the beam and stringer plate; and on the inner edge of the stringer plate, between the beams, an angle iron is to be fitted, of the size given for keelson angle irons in Table G 2, with its deep flange vertical, and covering the ends of the bracket plates.

STEAM VESSELS of 24 and under 25 feet in depth from the upper deck, or 16 and under 17 feet from top of the middle deck beams, to have hold beams fastened to every second and fourth frame alternately, or, they may have hold beams of extra strength, as given in Table G 3, fastened to every tenth frame; and to have an angle iron on the inner edge of the stringer plate, and gusset plates at the beam ends, as in the preceding case, or, they may be spaced wider, not exceeding twelve frame spaces, provided double angle irons, $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$, be fitted on the inner edge of the stringer plate, with a face plate on them $\frac{7}{16}$ of an inch in thickness.

STEAM VESSELS of 25 and under 26 feet in depth from the upper deck, or 17 and under 18 feet from the top of the middle deck beams, to have hold or lower deck beams fastened to every second and fourth frame alternately; or they may have hold beams of extra strength, as given in Table G 3, fastened to every tenth frame, and to have an angle iron on the inner edge of the stringer plate, and gusset plates at the beam ends, as in the preceding case, or these beams may be twelve frame spaces apart, provided double angle irons, $4 \times 3\frac{1}{2} \times \frac{7}{16}$ be fitted on the inner edge of stringer plate with their deep flange vertical, and with a face plate $\frac{8}{16}$ of an inch in thickness.

STEAM VESSELS of 26 and under 30 feet in depth from the upper deck, or 18 feet and under 22 feet from the top of the middle deck beams, to have hold or lower deck beams fastened to every alternate frame; or, if hold beams of extra strength, as given in Table G 3, be fitted, they may be fastened to every eighth frame, provided an angle iron of the size given for keelson angle irons in Table G 2, be fitted on the inner edge of the stringer plate, and gusset plates be fitted as in the previous case; or these beams may be spaced wider, not exceeding twelve frame spaces, provided double angle irons, $4 \times 4 \times \frac{8}{16}$, and a face plate $\frac{9}{16}$ in thickness be fitted on the inner edge of the stringer plate, with gusset plates at the beam ends.

STEAM VESSELS of 30 and under 33 feet in depth from the top of the upper deck beams to the top of floors, and in which the depth from the top of the lower deck beams is 15 and under 18 feet, to have the lower deck or hold beams fitted to every alternate frame, and to have below them an orlop stringer plate attached to the outside plating, of the thickness and three-fourths of the breadth, of the lower deck stringer plates, supported by bracket plates riveted to them and to alternate frames; and upon the inner edge of the stringer plate an angle iron, of the size of keelson angle irons, as per Table G 2, is to be fitted and riveted, so that its vertical flange may cover the ends of the bracket plates; or a stringer of other form may be fitted, if approved by the Committee.

STEAM VESSELS of 33 and under 36 feet in depth from the top of the upper deck beams to the top of floors, in which the depth from the top of the lower deck or hold beams is 18 feet or above, are to have the lower deck beams fitted to every alternate frame, and to have orlop beams, of the size given in Table G 3 for "hold beams of extra strength," fitted to every tenth frame, with stringer plates on them, and gusset plates at their ends.

Plans of vessels above 36 feet in depth to be submitted to the Committee for their approval.

When the beams exceed two spaces of frames apart, a knee or bracket plate is to be riveted to alternate frames and to the stringer plate.

Notwithstanding the foregoing arrangements for the spacing of beams, whenever a deck is laid the beams are not to be further apart than two frame spaces.

Where it is necessary, in consequence of long hatchways, engine-rooms, boiler spaces, &c., to dispense with some of the hold or lower deck beams, compensation must be made by fitting hold beams of extra strength as given in Table G 3, with gusset plates, and angle irons, &c. on the stringer plates,—regulated by the depth of the vessel, in accordance with the foregoing paragraphs of this Section.

If an arrangement differing from the foregoing in the spacing of the hold beams to suit convenience of stowage, be required, a sketch showing beams and stringers of extra strength, with all particulars, must be submitted through the Resident Surveyors, who are to state their opinion thereon, for the Committee's consideration.

TO PREVENT PANTING.

All vessels must have provision made to prevent panting, by extra beams, bracket knees, and stringer plates being fitted in the peaks, forward in sailing vessels and paddle steamers, and forward and aft in screw-propelled vessels and all vessels having a raised quarter-deck; the sizes, arrangement, and security of them to be to the satisfaction of the Surveyors.

In vessels having fine ends, these stringer plates are to be attached to the outside plating with an angle iron; and beams and stringer plates are to be fitted before the collision bulkhead, and also abaft, where necessary.

PILLARS.

Section 15. All beams, for at least one-half the length of the vessel amidships, the alternate beams before and abaft this length, and all carlings of hatchways, exceeding in length six spaces of frames, to be pillared; in addition, the beams under deck houses, bowsprit, pall bitt, windlass, steam winches, and capstan are to be pillared, and wherever else the Surveyors may deem necessary; the pillars to have not less than two rivets in each of their ends, so as to form a continuous tie from the keelson to the upper,

spar, or awning deck, and to be of the sizes given in Table G 1. Where a vessel has three decks or tiers of beams, the size of the pillars to the middle tier is to be a mean between the sizes given in Table G 1.

All pillars to have solid welded heads and heels.

Pillars which extend from the keelson to the upper deck beams, in vessels with two decks or tiers of beams, or to the middle deck beams in vessels with three decks or tiers of beams, are to have their diameter increased by three-eighths of an inch beyond that given in Table G 1.

If pillars be fitted on a shaft tunnel, the tunnel should be strengthened in way of them, by doubling plates and angle irons, or by other efficient means to the satisfaction of the Surveyors. Great care is to be taken to insure the beams in the engine room being pillared where practicable.

STRINGERS ON BEAMS.

Section 16. All vessels to have stringer plates upon the ends of each tier of beams. Those upon the ends of the upper deck beams of one or two-decked vessels, and upon the middle deck beams of three-decked vessels, and upon the main deck beams of spar and awning-decked vessels to be of the breadth and thickness given for main stringer plates in Table G 4 for half the vessel's length amidships; from thence to the ends of the vessel they may be gradually reduced to the dimensions given for the ends of main stringer plates on Table G 4.

The stringer plates on ends of the beams next below the upper deck in two-decked vessels, and below the middle deck in three-decked vessels, and below the main deck in spar or awning-decked vessels, to be of the total breadth and thickness given for Hold Beam Stringers in Table G 4.

The stringer plates on ends of upper deck beams, of three-decked vessels, to be of the same width as that given in Table G 4, but they may be one-sixteenth of an inch less in thickness.

The stringer plates on the ends of spar-deck beams are to be the breadth of, and may be two-sixteenths of an inch less in thickness, than the stringer plates given on the upper line of Table G 4 for vessels of the same plating number, and may be reduced at their ends to seven-sixteenths of an inch, and to the breadth given for the ends of main deck stringer plates in Table G 4.

The stringer plates on the ends of awning-deck beams to be of the same width as given in Table G 4 for hold beam stringer plates, and to be six-sixteenths of an inch in thickness when the plating number is under 14,000, and seven-sixteenths of an inch in thickness when the plating number is 14,000 or above.

The stringer plates on all tiers of beams are to be fitted home, and riveted to, the outside plating, all fore and aft, with angle irons of the dimensions required by Table G 2; the middle and lower deck stringer plates to have an additional angle iron extending all fore and aft, riveted to the reversed frames, and to the stringer plates.

Where there would be considerable bevel to the angle iron fitted on the stringer plate and to the reversed frame *aft*, the angle iron may be omitted for one-twelfth of the vessel's length at that end, and flanged plates substituted for angle irons at this part for attaching the stringer plates to the outside plating.

In cases where no deck is laid, and the width of the stringer plate on the ends of the hold beams is objected to, it may be reduced, provided such reduction be fully compensated for, and receive the sanction of the Committee.

The objectionable practice of cutting through the stringer plates for the admission of wood roughtree stanchions will not be allowed. When the frames are extended through the upper deck stringer plate to form roughtree stanchions or bridge-houses, there must be a continuous angle iron, of the size given for upper deck stringer angle irons, wrought on the upper deck stringer plate inside the frames.

The main and hold beam stringer plates may be reduced at the ends of the vessel to the sizes given for the same in Table G 4. Where a reduction of two-sixteenths of an inch in thickness is allowed, the stringer plates may be reduced one-sixteenth of an inch in thickness for one-eighth of the vessel's length before and abaft the half-length amidships, and from thence to the ends they may be reduced another sixteenth of an inch in thickness.

A lining piece should be fitted behind the upper deck stringer angle iron in one, two, three-decked, and spar-decked vessels, from butt-strap to butt-strap of the sheerstrake when single, to admit of those butt-straps being in one length, the lining piece being the thickness of the butt-straps, and increased in depth in way of scuppers to admit of being riveted to the sheerstrake above and below the upper deck stringer plate,—unless the sheerstrake extend sufficiently high above the stringer plate to admit of a butt-strap being fitted above the stringer in the throat of the angle iron, and extending high enough to take two rows of rivets vertically above the angle iron. When the sheerstrake is doubled it should be extended sufficiently high above the stringer plate, to take two rows of rivets vertically in the butts above the upper flange of the gunwale angle iron.

The upper deck stringer angle iron is in all cases to be fitted on the upper side of the stringer plate, with its deep flange vertical and turned upwards.

When gutter waterways are fitted to upper decks in vessels having poops or forecastles, the angle irons forming the ends of the gutters are to be welded, and the gutters to be carefully caulked; and it is recommended that, when completed, they be cemented.

TIE-PLATES ON BEAMS.

Section 17. All vessels to have tie-plates ranging all fore and aft upon each side of the hatchways, *on each tier of beams*, these plates to be lapped or butted, and at least double riveted. Upon hold beams where no deck is to be laid, or where tie-plates would interfere with stowage of cargo, double angle irons of the dimensions given in Table G 2 for angle irons on lower deck beam stringer plates, placed at middleline or at each side of the hatchways, extending fore and aft wherever practicable, and well riveted to all beams, deck hooks, and transoms, will be admitted in lieu thereof.

When diagonal tie-plates are fitted on beams in sufficient number, and to the satisfaction of the Surveyor, in one and two-decked vessels, or on the upper and middle deck beams in three-decked and spar-decked vessels, they are to be of the width and thickness given in Table G 4; and the stringer plates may be reduced in breadth by the width of the diagonal plates. Diagonal tie-plates are to be fitted on the hold beams abreast of the fore and mainmast partners of sailing vessels, where the masts are to be wedged.

Where diagonal tie-plates cross each other, or the fore and aft tie-plates, between the beams, and a deck is to be laid thereon, one set of tie-plates must be set down in way of the crossing, so as to leave one thickness only projecting above the beams.

The tie-plates to be of the width and thickness given in Table G 4, for half the vessel's length amidships, tapered at the ends to the same thickness as the ends of the stringer plates. They are to be well riveted to each other, and to the beams, deck hooks, and transoms; and all butts to be properly shifted.

HOOKS AND CRUTCHES.

Section 18. All stringers, where practicable, to extend fore and aft, and to be efficiently connected at their ends with plates forming hooks and crutches, to the satisfaction of the Surveyors.

PLATING.*

Section 19. The thickness of plating for half the vessel's length amidships, to be as given in Table G 1, but in sailing vessels where the number is 16,600, or above, three strakes of plating at the bilges are to be one-sixteenth of an inch thicker than therein prescribed.

No plates to be less in length than five spaces of frames, except the fore and after hoods.

No butts of outside plating in adjoining strakes to be nearer each other than two spaces of frames, and the butts of the alternate strakes not to be under each other, but shifted not less than one frame space.

The butts of the upper or main deck, and of spar deck stringer plates, in all cases, to be shifted not less than two spaces of frames clear of the butts of the sheerstrakes.

The butts of the garboard strakes to be shifted clear of the keel scarphs, and not to be nearer each other on opposite sides of the vessel than two spaces of frames.

All butts of plating where practicable, to be planed and fitted close; the edges of the plating to be sheared from their faying surfaces, or the burr caused by shearing to be carefully chipped off, and all outside edges of plating are to be either planed or chipped fair. The butts and edges to be carefully caulked.

The thickness of the sheerstrakes amidships to be as given in Table G 1, and their breadth to be not less than 30 inches where the number for plating is under 7,200; not less than 33 inches where the number is 7,200 and under 11,800; not less than 36 inches where the number is 11,800 and under 16,600; and not less than 40 inches where the number is 16,600 and above; except where the thickness is greater than prescribed, in which case the breadth may be diminished, provided the sectional area be not less than required by the Rules.

The sheerstrakes in one, two, three-decked, and spar-decked vessels, where the butt-straps do not extend to the upper edge in one length, to be fitted sufficiently high above the upper deck beam ends, so as to take two rows of rivets vertically in the butts above the upper flange of the gunwale angle iron.

The garboard strakes to be of the breadth and thickness amidships given in Table G 1.

The garboard strakes of screw-propelled vessels, if ten-sixteenths of an inch or more in thickness amidships, may be reduced one-sixteenth of an inch before and abaft the half length of the vessel; if nine-sixteenths of an inch and not less than seven-sixteenths, they may be reduced one-sixteenth of an inch *before* the half length only.

The garboard strakes of sailing vessels or paddle steamers, if seven-sixteenths of an inch or more in thickness, may be reduced one sixteenth of an inch before and abaft the half length of the vessel.

* When plates have to be doubled, the butts of these plates and of the doubling plates are to have butt-straps double riveted, and, in addition, these double plates are to be well riveted at the edges and middle of the plates between the frames in addition to the rivets which pass through the frames, and the middle of the plates to be riveted up before the edges; all butts of inside strakes to be riveted complete, independent of the outside strakes.

In no case is the treble riveting of the butts at the bilges to be dispensed with, excepting in the case of the strake or strakes, which are doubled.

All outside plating (excepting the garboard strakes and boss-plates), if not less than six-sixteenths in thickness amidships, may be reduced one-sixteenth of an inch for a fourth of the vessel's length at each end.

When the plates are ten and under twelve-sixteenths of an inch in thickness amidships, a reduction will be allowed of one-sixteenth of an inch for an eighth of the vessel's length before and abaft the half length amidships, and the remaining plates at the ends may be two-sixteenths of an inch less in thickness than those of their respective strakes amidships. When the plates are twelve-sixteenths of an inch or more in thickness amidships, they may be reduced three-sixteenths at the extreme ends of the vessel.*

The boss-plates covering the screw shaft are to be the same thickness as the strakes amidships of which they form part, where the number for plating is under 14,300; if that number and under 18,700, the plates are to be one-sixteenth of an inch thicker; and if the number is 18,700 and under 26,400, the plates are to be one-sixteenth of an inch thicker than the midship plating, and the butts treble riveted; and where the number is 26,400 and above, the boss-plates and the plates above and below the same to be two-sixteenths of an inch thicker than the midship plating, and their butt-straps extended from frame to frame; or the boss-plates are to be doubled.

When plates forming the outside strakes of plating exceed forty-four inches in breadth, their butts are to be treble riveted.

Where gutter waterways are adopted at the upper deck, the butt-straps of the bulwark plating are to be sufficiently broad to receive the spur in the middle of the bulwark stay; and when the plates do not exceed twelve feet in length they are to have stays fitted against the butt-straps, and an intermediate stay is to be fitted between the butts. In no case are the stays which support the bulwarks to be more than six feet apart. Their size may be from $1\frac{3}{8}$ in. to 2 in. in diameter, regulated by the length of the stay and the size of the vessel. These arrangements may be modified according to circumstances, if to the satisfaction of the Surveyors.

BUTT-STRAPS.†

Section 20. In vessels where the number for plating exceeds 13,100, the butt-straps of the upper deck beam stringer plate, sheerstrake, and of three strakes of plating round the bilges, for half the vessel's length amidships, are to be one-sixteenth of an inch thicker than the plates they connect, and treble riveted; where the numbers are above 8,900, and not exceeding 13,100, the same additional strength as the foregoing will be required, excepting that only the butts of two strakes round the bilges need be treble riveted.

In smaller vessels it will only be necessary to have the butt-straps of the sheerstrake, upper deck stringer plate, and one strake at the bilges, for half the length amidships, increased one-sixteenth of an inch, and double riveted.

* In sailing vessels the outside or overlapping strakes of plating for one quarter of the vessel's length at her fore-end should only be reduced one-sixteenth of an inch from the midship thickness.

† When plates have to be doubled, the butts of these plates and of the doubling plates are to have butt-straps double riveted, and, in addition, these doubling plates are to be well riveted at the edges and middle of the plates between the frames in addition to the rivets which pass through the frames, and the middle of the plates to be riveted up before the edges; all butts of inside strakes to be riveted complete, independent of the outside strakes.

In no case is the treble riveting of the butts at the bilges to be dispensed with, excepting in the case of the strake or strakes, which are doubled.

A lining piece should be fitted behind the upper deck stringer angle iron in one, two, three-decked, and spar-decked vessels, from butt-strap to butt-strap of the sheerstrake when single, to admit of those butt-straps being in one length, the lining piece being the thickness of the butt-straps, and increased in depth in way of scuppers to admit of being riveted to the sheerstrake above and below the upper deck stringer plate,—unless the sheerstrake extend sufficiently high above the stringer plate to admit of a butt-strap being fitted above the stringer in the throat of the angle iron, and extending high enough to take two rows of rivets vertically above the angle iron. When the sheerstrake is doubled, its breadth should be extended sufficiently high above the stringer plate to take two rows of rivets vertically in the butts above the upper flange of the gunwale angle iron.

All butt-straps to be of the breadth given in Table G 1, and in no case to be less in thickness than the plates they connect; the fibre of the iron to be in the direction of the fibre of the plates they connect.

LINING PIECES.

The space between the plating and the frames to have solid filling or lining pieces in one length, closely fitted; to be of the same breadth as the frames, excepting in way of bulkheads, where they are to be fitted as stated in Section 22, Paragraph 5.

RIVETING AND RIVETS.*

Section 21. The landing edges of outside plating when seven-sixteenths of an inch in thickness and above from the keel to the upper turn of bilge, and when nine-sixteenths of an inch and above from the upper turn of bilge to the gunwale, must be double riveted; below these thicknesses the edges may be single riveted. In all cases the thicker of the two plates is to regulate the size of the rivets, and the requirements as to double riveting. When the plating is of a thickness amidships to require the edges to be double riveted, the same is to be continued all fore and aft. The stem, sternpost, keel, butts of outside plating, breasthooks, transoms, stringer and tie-plates on beams, also butts of keelsons, stringers, and all longitudinal ties, to be at least double riveted in all vessels.

The butts of outside plating to be chain riveted. All double and treble riveting, except in the keel, stem, and sternpost, is recommended to be chain riveting.

In chain-riveted butts, a space equal to twice the diameter of the rivet to be between each row; where treble riveting is adopted, a space equal to twice the diameter of the rivet, to be between each row, with half the number of rivets in the back row.

The overlaps of plating where chain riveting is adopted, are not to be less than six times the diameter of the rivets; and where single riveting is admitted, to be not less than three and a half times the diameter of the rivets.

The butts of side plating of partial awning-decks, poops, top-gallant forecastles, and bulwarks, may be *single* riveted.

* When plates have to be doubled, the butts of these plates and of the doubling plates are to have butt-straps double riveted, and, in addition, these doubling plates are to be well riveted at the edges and middle of the plates between the frames in addition to the rivets which pass through the frames, and the middle of the plates to be riveted up before the edges; all butts of inside strakes to be riveted complete, independent of the outside strakes.

In no case is the treble riveting of the butts at the bilges to be dispensed with, excepting in the case of the strake or strakes, which are doubled.

The rivets are not to be nearer to the butts or edges of the plating, butt-straps, or of any angle iron, than a space equal to their own diameter; and, in edge riveting, the space between any two consecutive rows of rivets must not be less than once and a half their diameter.

The rivet holes to be regularly and equally spaced and carefully punched from the faying surfaces opposite each other in the adjoining parts, laps, lining pieces, butt-straps, and frames; and to be properly countersunk where necessary. They are to be spaced not more than from four to four and a half diameters apart from centre to centre, excepting in the keel, stem, and sternpost, where they may be five diameters, and through the frames and outside plating, and in reversed angle irons on frames, where they may be eight diameters apart from centre to centre. The rivets in the flanges of the gunwale angle irons to be spaced not more than four and a half diameters apart from centre to centre; and those connecting iron decks and stringer plates to the beams, to be spaced from seven to eight diameters apart.

There are not to be less than four rivets in each flange of the angle irons between the frames which connect the stringer plates and intercostal plates to the outside plating, where the spacing of the frames from centre to centre is twenty-three inches and above; but where the frames are closer spaced, there are not to be less than three rivets.

The rivets are to be of the best quality, and to be in diameter as per Table G 1, and to be increased in size under their heads to fill the rivet holes. When riveted up, the rivets are completely to fill the holes, their heads are to be "laid up," and their points or outer ends are not to be below the surface of the plating.

BULKHEADS.

Section 22. Screw-propelled vessels, in addition to the engine-room bulkheads, to have a water-tight bulkhead, built at a reasonable distance from each end of the vessel.

The foremost or collision bulkhead in all cases (except in awning-decked vessels), to extend from the floorplates to the upper deck, and to be in position to the satisfaction of the Surveyors.

The engine-room bulkheads to extend from the floor plates to the upper deck, in vessels with one or two decks; and to the main or middle deck in three-decked cargo, and spar-decked vessels. The aftermost bulkhead will be required to extend to the height of the upper deck, unless it be connected to a water-tight platform or deck of iron, extending entirely round the after part of the vessel, thus rendering the lower after body a water-tight compartment; this bulkhead is to be made water-tight by a stuffing box where the screw shaft passes through.

In sailing vessels the foremost or collision bulkhead only will be required.

All plating of bulkheads to be of the thickness prescribed in Table G 1; and when fitted between two frames at each side of the vessel, to be strongly riveted through them; or if attached only to one frame, then to have brackets or knee plates riveted horizontally against the side plating of the vessel, and to the bulkheads, on the foreside and aftside alternately, near the middle of each strake of the outside plating, and to be strongly riveted thereto. Lining pieces between frames and outside plating, in way of bulkheads, are to extend in one piece from the foreside of the frame afore to the aftside of the frame abaft the bulkhead frames.

The bulkheads to be supported, vertically on one side, by angle irons of the dimensions given in Table G 1, not exceeding two feet six inches apart; and to be efficiently connected and riveted thereto, and to the corresponding floors, beams of the several decks, and the frames. On the opposite side of the bulk-

heads a horizontal angle iron of the size of the main frames is to be fitted at the height of the hold beams, and where the depth of hold from top of these beams is over eight and under twelve feet, an additional horizontal angle iron of the same size is to be fitted half-way between it and the top of the floors; and when twelve feet or above, two such angle irons are to be fitted between the hold beams and the floors. All such bulkheads to be caulked and made thoroughly watertight to the satisfaction of the Surveyor.

The upper half depth of bulkhead plating may be one sixteenth of an inch less in thickness than the lower half when the latter is six-sixteenths of an inch or above in thickness.

WOOD DECKS.

Section 23. The flat of decks, if of wood, to be of good quality, properly seasoned, free from sap and objectionable knots; the thickness and fastenings as per Table G 2.

In all cases the margin or boundary planks of weather decks in vessels intended for the 90^A class or above, to be either Teak or Greenheart.

If the deck is of teak, it may be *one-sixth* less in thickness than prescribed in Table G 2.

When the deck planks are six inches in width and under, single fastening will be sufficient; but when they are above six inches and not exceeding eight inches in width, there must be two bolts in each plank in every beam, one of which may be a short screw bolt; and planks exceeding eight inches in width must be double fastened with nut and screw bolts.

The upper deck to be fastened by screw bolts, with nuts at the under side of the angle iron of the beams, and tie-plates. The bolts must be properly sunk, *with oakum and white lead under their heads*, and be carefully covered over with turned dowels, bedded in white lead, marine glue, or other suitable composition. It is recommended that the screw bolts be galvanized.

Upper decks must be renewed when worn in thickness as follows, viz.:—When a deck originally required to be 4 inches thick is worn to 3 inches; 3½ inches to 2¾ inches; 3 inches to 2½ inches.

IRON DECKS. (See also Table G 4.)

Where iron decks are fitted of six-sixteenths of an inch in thickness and under, and no wood deck is laid on the same, beams of angle iron, of the size given in Table G 3, are to be fitted to every frame, except at the ends of the Hatchways, where they are to be of Bulb iron, of the size required by the Rules for vessels of the same breadth having no iron deck. A stringer is to be fitted in such cases at the middle line of the vessel to the under side of the iron deck, formed of a bulb plate scored over the vertical flange of the beams, and connected to the deck by angle irons. Or any other approved web may be fitted if extending sufficiently below the beams to admit of the pillars being riveted to the same.

Where iron decks exceed the above thickness, Bulb iron beams may be fitted to alternate frames in the usual manner, but where no wooden deck is to be laid on the iron deck, angle iron half beams, of the size given in Table G 3, are to be fitted to every frame in the way of all Hatchways.

When the deck plating is seven-sixteenths of an inch in thickness amidships, it may be reduced one-sixteenth of an inch before and abaft the half-length amidships.

If a wood flat be laid over an iron upper deck, it may be half-an-inch less in thickness than prescribed by

Table; and in such cases, the iron deck, if five or six-sixteenths of an inch in thickness, may be reduced one-sixteenth of an inch before and abaft the half length; if seven-sixteenths in thickness amidships, it may be reduced to six-sixteenths for an eighth of the length before and abaft the half length, and the remainder to five-sixteenths of an inch.

The butts of the iron deck to be double riveted for half the length amidships; and where large openings are cut in iron decks, compensation is to be given for the same.

If a wood flat be laid over an iron middle deck, it may be $2\frac{1}{2}$ inches in thickness.

DOUBLE BOTTOMS.*

Section 24. To entitle a vessel to be noted in the Register Book as having a "*Double Bottom*," the inner or second bottom must extend through the engine and boiler space, to within a few frame spaces of the collision and aftermost bulkheads. Where a "*Part Double Bottom*" is fitted, its length will be recorded in the Register Book.

The inner or second bottom must be efficiently constructed and made watertight; the plating of it not to be less than five-sixteenths of an inch in thickness, where the vessel's number is under 10,450; if of that number or above, it is to be six-sixteenths of an inch in thickness, and the flange or side plate in each instance must be one-sixteenth of an inch thicker. The double bottom to be efficiently connected to the outside plating and frames of the main body of the vessel; and when reversed frames are cut they must be compensated for by doubling the frames with short angle irons of their own size. The butts and edges of the plates may be single riveted. "Man holes" must be constructed, or provision made for the removal of a portion of the plates so as to enable the inner surface of outside plating, the frames, floors, keelsons, and rivets to be thoroughly examined and coated when required. Air-pipes to be fitted, and the double bottom to be tested on completion with a head of water at least equal to the extreme draught of water of the vessel.

The upper side of the plating must be protected with wood planking as ceiling, in no case to be less than $2\frac{1}{2}$ inches in thickness.

Where double bottoms are fitted in the fore and after holds, and not extended through the engine room, great care should be taken to provide against an abrupt termination in the longitudinal girders; they are either to be carried through the engine room, or fully compensated for, by connection with the longitudinal engine and boiler bearers, or otherwise, to the satisfaction of the Surveyor.

Any other plan of fitting double bottoms may be adopted where sufficient longitudinal strength is arranged, provided in the first instance it receives the approval of the Committee.

Where double bottoms, or part double bottoms, are fitted with longitudinal girders on the floors, all the outside plating (except the garboard strakes) which is entirely within the boundary of them, may be one-sixteenth of an inch less in thickness than that prescribed in Table G 1, provided that thickness be ten-sixteenths of an inch or more.

* Side intercostal plates or side keelsons need not be fitted in the range of double bottoms; but where partial double bottoms are fitted, these keelsons are to extend into, or scarp the double bottom not less than three spaces of frames, and be connected to the longitudinal girders where practicable.

No class will be assigned to vessels having a double bottom or part double bottom unless such double bottom or part double bottom be constructed in accordance with the requirements of the Rules, or of strength equal to that prescribed thereby.

CEILING.

Section 25. All vessels to be closely ceiled from the main keelson to the upper part of the bilges, the ceiling to be secured in such a manner as to be easily removed. From the upper part of the bilges upwards, either batten and space or close ceiling may be adopted, but the former is considered preferable.

The ceiling on the floors is to be made in hatches where practicable, of convenient sizes, and when not so arranged, to be fastened to the reversed angle irons or frames in such a manner as to be removed when required for the purpose of survey, or for cleaning and painting.

For thickness of ceiling, *see* Table G 2.

ENGINE SPACE.

Section 26. In vessels propelled by machinery, care must be taken that the engine and boiler bearers are properly constructed, having efficient longitudinal ties; and where the bearers may interfere with the longitudinal strength of the vessel, they must extend a sufficient distance beyond the bulkheads of the engine and boiler space, to compensate for such interruption.

When the machinery and boilers are fitted, as many hold or lower-deck beams of extra strength, as per Table G 3, are to be introduced as may be practicable; and the vessel to be otherwise made secure where necessary in the engine-room, to the satisfaction of the Surveyors. *See* page 62, paragraph 7.

In the engine and boiler space, double reversed angle irons must be fitted to every floor, from bilge to bilge; and in vessels where the number for plating is 15,500 and under 21,700, they are to extend to the top of the bilges. Where the number is 21,700 and above, web frames are to be fitted, about 10 feet apart, formed of plates the thickness of the floor plates, and sufficiently broad to receive double angle irons on the inner edge, passing within the bilge stringer angle irons, and extending from the hold beam stringer plate to scarp the ends of the floors.

SHAFT TUNNEL.

The plating of Shaft Tunnels to be from $\frac{4}{16}$ to $\frac{6}{16}$ of an inch in thickness, in proportion to the size of the vessel: the top plating in way of the hatchways to be not less than $\frac{2}{6}$ of an inch thicker than the remaining plates, or to be covered with wood not less than two inches thick. The tunnel to be additionally strengthened with transverse angle irons not more than eight feet apart, of the size of the reversed frames, and the plating to be caulked and made watertight.

COCKS AND VALVES.

Section 27. A sluice cock or valve is to be fitted at the limbers, at each water-tight bulkhead, to allow water to be shut off, or to reach the pumps when required; the same to be fitted, so as to be controlled above the load water-line, and to be boxed in, to prevent injury.

The shut-off valves or cocks of all openings for the inlet or outlet of water, in connection with the engines and boilers, are to be fitted close to the vessel's sides, and are to be accessible at all times.

All head and stern pumps to be efficiently provided with stop-cocks, to the satisfaction of the Surveyors

HATCHWAYS AND MAST PARTNERS.

Section 28. All hatchways are to be properly framed to receive half beams where required, and the mast-holes to have partners at the upper deck and at the tier of beams where the masts are wedged, the plating of which is not to be less in thickness than is required for stringer plates, and the united breadths of the plates are not to be less than twice the diameter of the masts. These plates are to be well riveted to each other, and to the beams; and at the decks where the masts are to be wedged, an angle iron of the dimensions required for the main frame of the ship is to be properly fitted and riveted to the plate round the mast-holes.

It is recommended to have only one large angle iron on the beams where comings are intended to be fitted, of sufficient size to compensate for double angle irons, the angle iron to be on the side of the beam that will be clear of the hatchway space. Plates are to be fitted and riveted to these beams, where necessary, in order that the ends of the deck may be properly fastened.

Where upper deck hatchways, or engine and boiler openings, are about twelve feet and not exceeding sixteen feet in length, strong shifting beams are to be fitted with proper means for firmly securing the same. Where the length is above sixteen feet and not exceeding twenty feet, a deep web plate or shifting beam is to be fitted between double angle irons, at the middle of the length, extending the depth of the coming and carlings; and the fore and aft tie-plates in way of the same, and extending two spaces of beams beyond each end of the hatchway or opening, are to be double the width of that given in Table G 4, or such other arrangement as may be considered equal thereto may be adopted, if approved by the Committee. When the length exceeds twenty feet, a deck plan is to be submitted for the approval of the Committee, showing the necessary additional transverse strength proposed to be applied, either by increasing the number of web plates, and the width of the stringer and tie-plates, or by plating the beams in way of the same, as the case may require. Where iron decks are fitted, as required by the rules, additional strength is to be applied around all hatchways of twenty feet and above, either by doubling the plating, or by fitting plates of the breadth and thickness required for tie-plates in Table G 4.

All hatchway comings on weather decks, and the companions at the fore end of steamers to be of iron.

In all cases where half beams are required, fore and aft carlings, of the same size and description as the hatchway beams, are to be fitted in the hatchway spaces; the plates forming the comings and headledges are to be of sufficient strength in proportion to their size, and are to extend to the lower edge of the beams and carlings, and must be riveted to them, excepting that when the beams are of bulb iron they may then terminate on the bulb; where coming plates are of extra thickness, the carlings may be dispensed with.

Half beams are to be fitted to alternate frames between the hatchway beams, and their ends are to be secured by the angle irons on their upper edges being made knee-shaped, and fitted and riveted to the fore and aft carlings or comings. In addition, fore and aft tie-plates are to be fitted close to the comings and riveted to the beams and half beams. An angle iron with its flange of sufficient depth to extend half an inch above the deck, is to be fitted and riveted to the comings and headledge plates, and to the beams and tie-plates; its upper edge to be properly caulked, and the rivets used in its vertical flange to be countersunk and flush headed.

SKYLIGHTS AND TRUNK BULKHEADS AROUND ENGINE HATCHES.

Section 29. The skylights to engine-rooms are in all cases to be substantially constructed; the comings to which they are attached are to be of iron efficiently fastened to the beams, and are to be not less than thirty inches above the upper deck in one, two, or three-decked vessels, and in spar-decked vessels; in awning-decked vessels, they must not be less than eighteen inches above the awning deck.

The skylights to be securely attached to the comings, and the glass in them should be very strong (from three-eighths to half an inch thick), protected by a strong guard of iron or brass rods, or by a frame work of wire; in addition, dead lights of either iron or wood must be fitted, having bull's eyes in them, and arrangements made for their efficient security in bad weather.

In steam vessels, with three decks or tiers of beams, and in spar and awning-decked vessels, and those having either a poop or bridge house with the engine-room beneath, the engine-room hatchways in the main deck are to be enclosed by iron trunk bulkheads, efficiently strengthened by angle iron, and extended from the main deck to the beams above, to which they are to be secured; or, in one or two-decked vessels, to have comings at least thirty inches in height above the main deck. Strong iron doors will be allowed in these trunk bulkheads, provided their lower parts are at least eighteen inches above the main deck, and arrangements made for their efficient security.

Where engine or boiler openings are above twenty feet in length, the beams abreast of them on the main deck are to be covered with plating, which is to taper towards the stringer plate, for a distance beyond the openings, at each end, not less than the breadth of the plating required to be fitted; the thickness of this plating to be the same as given in Table G 4 for iron decks.

COAL BUNKER PIPES AND LIDS.

Section 30. Coal bunker pipes, where practicable, are to be formed so as to be at least six inches above the upper deck, fitted with gratings and lids, the latter to have studs, to fit in openings made in the pipes, for their security, the pipes to be so formed that tarpauling may be securely lashed over them. Where it is necessary to fit flat coal bunker scuttle lids flush with the deck, they must be secured by a bar, or other approved fastening.

PORTS AND SCUPPERS.

Section 31. All vessels must be fitted with a sufficient number of ports and scuppers, to readily discharge any large quantity of water from the upper deck. The ports and flaps, where such are adopted, are to be hung by strong hinges, and the scuppers formed in the vertical flange of the upper deck stringer angle iron, which is to be increased in depth, so as to enclose the scuppers; or any other equally efficient plan may be adopted.

Where the bulwark plating and roughtree rail are cut through to form a cargo port, the bulwark stays at each end of the port should be of increased strength, to the satisfaction of the Surveyors.

A sufficient number of scuppers, with proper pipes attached to them, are to be fitted in all 'tween decks to convey water or leakage to the bilges.

VENTILATORS.

Section 32. It is recommended that ventilators, sufficient in number and size, be efficiently fitted to the upper deck of all vessels.

When scuttles are fitted for ventilation in the topsides of vessels, strong covers for them are to be provided; these covers to be efficiently fitted, to the approval of the Surveyors.

Where scuttles are fitted in the sheerstrake within three-fifths the vessel's length amidships, compensation is to be given either by an extra thickness in the sheerstrake, doubling plate in way of the scuttles, or else by the introduction of strong angle iron over them.

CHAIN PLATES.

Section 33. The chain plates to be in proportion to the size of the vessel, and riveted efficiently to the outside plating (not bulwark plating), the sheerstrake being preferable.

BITTS.

Section 34. All bitts, when not of iron, and which do not go down to the deck below, to be fitted into iron sockets fastened through the deck to plates riveted to the beams.

CEMENT.

Section 35. The frames and plating of the bottom of all vessels to the upper part of the bilges to be thickly and efficiently covered with Portland or other approved cement, which may be mixed with sand or other suitable substance. Care to be taken to have a proper substance of cement at its termination, and to keep the water-courses clear all fore and aft. The whole to be to the satisfaction of the Surveyors.

RUDDER.

Section 36. The rudder to be made to ship and unship while the vessel is afloat. The size of main piece, given in Table G 2, to be regulated by the number which regulates the thickness of the vessel's plating; it is to be of the best hammered iron. The frame of the rudder and main piece to be one forging; the frame to be properly stayed by wrought-iron stays welded on the frame, and to be carefully plated and riveted. It is recommended that the pintles be made independent of the frame.

WINDLASS.

Section 37. The windlass, *for all grades*, if of wood, may be composed of either of the following timbers; namely, English, African, or Live Oak; Adriatic, Italian, Spanish, Portuguese, or French Oak; East India Teak, Morung Saul, Greenheart, Morra, and Iron Bark. The iron spindle in all cases to pass through the body of the windlass.

PUMPS.

Section 38. In addition to the engine pumps in steam vessels, an efficient pump is to be fitted in the bilges, on each side of the vessel, to each cargo compartment, capable of being worked from the upper or main deck.

EQUIPMENT.

Section 39. The equipment as regards anchors, chains, warps, &c., is to be regulated by the number produced by the sum of the measurements of the half moulded breadth of the vessel amidships, her depth from the upper part of keel to the top of the upper deck beams, and the girth of her half midship section to the same height, multiplied by her length, for a one, two, or three-decked vessel, and for a spar-decked vessel.

For a vessel with an awning deck, the equipment number to be increased one-sixth beyond that which it would be if she were flush-decked, and without an awning deck.

For a steam vessel with a partial awning deck, poop, top-gallant forecastle, or a raised quarter deck, the equipment number to be increased one-tenth, and for a sailing vessel with such erections one-fifteenth, beyond that which it would be if she were flush-decked.

For the equipment as regards anchors and chains, *see* Table 22 and footnotes thereto.

All vessels under 150 tons to be provided with one good Boat; and every vessel of 150 tons, and above, to have a suitable number. The Surveyors are to be particular in examining and reporting the condition of the boats of all vessels.

In Ships navigated by steam, the boilers and machinery are to be considered as part of the equipment, and, unless the Surveyors are satisfied of their efficiency, the figure 1 will be withheld.

With respect to the boilers and machinery of new steamers built for classification, and of vessels being fitted with new engines and boilers, they are required to be submitted to the inspection of the Society's Engineer-Surveyors, who will furnish a report to the Committee describing them, in the manner and form, No. 8 annexed. The Committee will thereupon, if found satisfactory, grant a certificate, and insert in the Register Book the notification "Lloyd's MC." (*in red*) indicating that the boilers and machinery have been inspected by the Engineer-Surveyors, and are certified to be in good order and safe working condition. (*See* Section 81.)

In order to facilitate this inspection, the Engineer-Surveyors should examine the plans of the boilers and approve of the strengths for the intended working pressure.

Any novelty in the construction of the machinery or boilers to be reported to the Committee.

The boilers, together with the machinery, to be inspected at different stages of construction.

The boilers to be tested by hydraulic pressure in the presence of the Surveyor to twice the intended working pressure.

Two safety-valves to be fitted to each boiler. If common valves are used, their combined areas to be half a square inch to each square foot of fire-grate surface; if improved valves are used, they are to be set to the working pressure, and tested under steam in the presence of the Surveyor.

Stop-valves to be fitted so that each boiler can be worked separately.

Each boiler to be fitted with a separate steam-gauge, to accurately indicate the pressure.

Each boiler to be fitted with separate blow-off cocks independent of those on the vessel's skin, which are to be so constructed that the spanners or keys can only be fixed or taken off when they are shut.

With a view to insuring better control over cocks, valves, and pipes connecting the engines and boilers with the sea, they are to be fixed as follows, viz. :—

All cocks fitted on the plating of steam vessels to be raised above the level of the stoke-hold plates on the turn of the bilge, or attached to Kingston valves of sufficient height to lift them up to the level of the stoke-hold plates.

All discharge-pipes to be, if possible, carried above the deep load-line, and to have discharge-valves fitted on the plating of the vessel.

No pipes to be carried through the bunkers without being properly protected.

The bilge suction-pipes to be arranged so that they can pump from each compartment, and from the bilge of the engine-room, the roses to be fitted in a convenient place, where they can be accessible.

Cocks and valves connecting these pipes to be fixed above the stoke-hold plates.

The arrangement of bilge-pumps, bilge injections, suction and delivery pipes, to be such as will not permit of water being run from the sea into the vessel by an act of carelessness or neglect; any defective arrangement to be reported to the Committee.

REPORTS ON VESSELS.

Section 40. The Surveyors, in submitting their Reports of vessels not already classed, are in all cases, where practicable, to forward a Sketch of the Midship Section, and other drawings where necessary, to be furnished by the Builders, with figured dimensions of the component parts marked thereon.

Builders wishing to adopt plans other than those described herein, are to submit them through the Resident Surveyors (who are to state their opinions thereon), for the Committee's consideration and approval.

THREE-DECKED STEAM VESSELS.

Section 41. Steam vessels not less than 15 feet depth of hold to the middle deck, having two or more complete decks laid and caulked, and a tier of hold beams, or extra strong hold beams and stringers in lieu thereof, and in which the space between the upper and middle decks is intended for the stowage of general cargo, will have their scantlings determined as follows, and will be marked in the Register Book "Three-Decked Rule."

The scantlings of the frames, reversed frames and floor-plates, the thickness of bulkheads, and diameter of pillars, are determined by the number produced by the deduction of *seven feet* from the sum of the measurements in feet, arising from the addition of the half-moulded breadth of the vessel amidships, the depth from the upper part of the keel to the top of the *upper deck beams*, and the girth of the half midship frame section measured from the centre line at top of keel to the *upper deck stringer plate*.

The scantlings of the keel, stem, sternpost; the thickness of the outside plating, keelson and stringer plates, and deck; also the scantlings of the angle irons on beam stringer plates, and keelson and stringer angle irons in hold, as in Tables G 1, G 2, and G 4, are governed by the number obtained by multiplying that which regulates the size of the frames, &c., by the length of the vessel.

All the frames are to extend to the upper deck stringer plate.

The reversed frames are to extend to the upper part of the middle deck beam stringer angle iron, and to the upper part of the frames alternately.

The plating to be of the thickness given in Table G 1 from the keel to the gunwale; the sheerstrake to be placed at the gunwale, and the strake of plating in way of the middle deck to be an outside strake.

The middle deck stringer plate to be of the breadth and thickness prescribed in Table G 4; it is to be fitted and connected to the outside plating by angle irons between the frames of the size given for beam stringer angle iron, and in addition, an inner stringer angle iron of the same size, passing continuously fore and aft, must be riveted to reversed angle iron on each frame, and to the stringer plate—the space between this angle iron and the outside plating, all fore and aft, to be filled in and made watertight. Similar angle irons are to be riveted to the stringer plate, reversed frames, and outside plating, at the lower deck stringer.

Where there would be considerable bevel to the angle iron fitted on the stringer plate and to the reversed frame *aft*, the angle iron may be omitted for one-twelfth of the vessel's length at that end, and flanged plates may be substituted at that part for angle irons for attaching the stringer plates to the outside plating.

A reduction of one-sixteenth of an inch from the thickness required by Table G 4 for the middle deck stringer and tie-plates, will be allowed for those of the upper deck; but their widths must not be less than those of the middle deck.

The butt-straps of the sheerstrake and upper and middle deck stringer plates and of three strakes of plating at the bilge, to be one-sixteenth of an inch thicker than the plates they connect, and treble riveted, for half the vessel's length amidships.

In these vessels, a side intercostal keelson is to be fitted and attached to the outside plating by angle irons of not less size than $3 \times 3 \times \frac{7}{16}$; but if the plating number is 21,700 or above, then these angle irons must not be less than $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$. When a double bottom is fitted, this keelson may be dispensed with in the range thereof.

The thickness of the flat of upper deck is to be as given in Table G 2. In all cases a middle deck is to be properly laid and caulked, the thickness of which may be one-half inch less than that prescribed for the upper deck.

Engine room hatchways on the main deck are to be enclosed by iron trunk bulkheads, efficiently strengthened, and extended from the main deck to the upper deck.

If in such vessels the length exceeds *eleven* times the depth taken from the *upper part of the keel* to the top of the *middle deck beams*, additional strength will be required at the bilge and bottom, as per Section 46; but no additional strength at the sheerstrake and stringer plate will be needed until the length exceeds *eleven* times the depth taken from *the upper part of the keel* to the top of the *upper deck beams*; when this is the case, additional strength will be required in the *upper deck* sheerstrakes and stringer plates, as per Section 46, relating to vessels' proportions.

SPAR-DECKED STEAM VESSELS.

Section 42. Vessels noted in the Register Book as "Spar decked," are those which are of lighter construction than vessels built under the three-decked rule; they must have three tiers of beams, and be not less than 15 feet depth of hold to the main deck, and no erections will be allowed on the spar deck except such as are necessary for navigation.

In such vessels the scantlings and arrangements are to be regulated by the dimensions under the main or middle deck, as in those having one or two decks.

All the frames must extend to the spar-deck stringer plate, or to the lower part of the curve when of a rounded form at the gunwale.

The reversed angle irons on the frames are to extend to the upper part of the main or middle deck beam stringer angle iron, and to the upper part of the frames, alternately.

When the plating number is under 13,100, the plating from the main to the spar-deck sheerstrake must not be less than six-sixteenths of an inch in thickness; if 13,100 and under 16,600, it must not be less than seven-sixteenths of an inch in thickness; and if 16,600 and under 35,200 it must not be less than eight-sixteenths of an inch; and if 35,200 or above, it must not be less than nine-sixteenths of an inch in thickness.

A reduction of two-sixteenths of an inch from the thickness required by Table G 1 for the main deck sheerstrakes, and from that given in the upper line of Table G 4 for stringer and tie-plates, will be allowed for those of the spar deck; but their widths must not be less than those of the main deck.

The butt-straps of the spar and main deck sheerstrakes and stringer plates, and of three strakes of plating at the bilges, to be one-sixteenth of an inch thicker than the plates they connect, and treble riveted for half the vessel's length amidships.

In these vessels, a side intercostal keelson is to be fitted, and attached to the outside plating by angle irons of not less than $3 \times 3 \times \frac{7}{16}$; but if the plating number is 21,700 or above, then these angle irons must not be less than $3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$. When a double bottom is fitted, this keelson may be dispensed with in the range thereof.

The lower edge of the main sheerstrake must not be more than one-half its depth below the main deck stringer plate.

When the spar-deck is constructed of a rounded form at the gunwale, the beams may be of plain angle iron, if of not less strength than prescribed above, and are to scarph the main frames with not less than two feet lengths, and to be properly riveted to them. The rounded gunwale plates are to be of the same thickness as the spar-deck stringer plates, and properly constructed, to the satisfaction of the Surveyors.

The main deck stringer plate is to be fitted and connected to the sheerstrake by angle irons between the frames, of the size given for beam stringer angle iron, and in addition, an inner stringer angle iron of the same size, passing continuously fore and aft, must be riveted to reversed angle iron on each frame, and to the stringer plate; the space between this angle iron and the sheerstrake, all fore and aft, to be filled in and made watertight. Similar angle irons are to be riveted to the stringer plate, reversed frames, and outside plating at the lower deck.

Where there would be considerable bevel to the angle iron fitted on the stringer plate, and to the reversed frame *aft*, the angle iron may be omitted for one-twelfth of the vessel's length at that end, and flanged plates may be substituted at that part for angle iron for attaching the stringer plate to the outside plating.

These vessels are to have a complete main or middle deck $3\frac{1}{2}$ inches in thickness, properly laid and caulked; and a main or middle deck sheerstrake of the thickness prescribed by Table G 1.

The flat of spar deck to be not less than $3\frac{1}{2}$ inches in thickness.

Engine room hatchways on the main deck are to be enclosed by iron trunk bulkheads, efficiently strengthened and extended from the main deck to the spar deck.

The measurement of depth, for regulating the additional strength required for vessels of extreme proportions given in Section 46, is to be taken from the upper part of keel to the top of the *main or middle deck beams*.

When Section 46 (relating to vessels' proportions) applies to these vessels, the increased strength defined for sheerstrakes and stringer plates is to be added to those of either the upper or middle deck.

They are to have extra strength at their bilges in the proportion of their length to depth from main deck as prescribed in Section 46; they may, however, be 12 and under 13 depths in length before they are required to have the remaining extra strength prescribed for vessels of 11 to 12 depths in length, and such vessels exceeding the above proportions to have extra strength in the same relation to that prescribed for one and two-decked vessels.

Vessels to which this rule applies, as regards an entire spar deck, will be noted in the Register Book thus:—"Spar decked."

AWNING-DECKED VESSELS.

Section 43. An awning-decked vessel is one having a light superstructure fore and aft on the main or upper deck proper of the vessel, intended to shelter passengers, or cattle, or for the conveyance of cargo, either light in its nature or limited in quantity. In such vessels the scantlings and arrangements of the frames, reversed frames, the thickness of bulkheads, and diameter of pillars in Table G 1, are to be regulated by the dimensions under the main or upper deck, as in a one, two, or three-decked vessel, exclusive of the awning deck.

The plans of such vessels and a maximum load-line must be submitted to the Committee for approval, and the load-line thus sanctioned is to be inserted in the Certificate and in the Register Book, and on the ship's sides.*

Awning-decked vessels loading to a greater draught of water than such maximum load-line will thereby lose their character in the Register Book.

Vessels to which this rule applies, as regards an entire awning deck, will be noted in the Register Book thus, "Awning decked."

Such erections only as are necessary for navigating these vessels will be allowed on the awning deck.

All the main frames must extend to the awning deck stringer plate, or to the lower part of the curve when of a rounded form at the gunwale. To be of the size given in Table G 1, but in no case to be less than $3 \times 3 \times \frac{6}{16}$.

The height to which the reversed frames are to be carried to be regulated by the numbers, as in one, two, or three-decked vessels. See Section 8.

All the side plating above the main sheerstrake in vessels whose number is under 14,000 to be not less than five-sixteenths of an inch in thickness; if of that number or above, to be not less than six-sixteenths in thickness.

The awning deck stringer plate to be of the breadth given in Table G 4 for hold beam stringers, and to

* See Circular, No. 354, in Appendix.

be not less than six-sixteenths of an inch in thickness where the plating number is under 14,000, and seven-sixteenths where the plating number is 14,000 or above.

The tie-plates to be of the same thickness as given above for the stringer plates, and to be in breadth as in Table G 4 for main deck tie-plates.

The butts of the awning deck side plating above the main deck, and of the awning deck stringer and tie-plates, are to be double riveted.

A reduction of one-fourth from the thickness prescribed for the main deck will be allowed for the flat of awning deck.

The beams to be of the sizes given in Table G 3. They are to be placed at every alternate frame, and if the vessel is of a rounded form at the gunwale, to scarp the main frames not less than eighteen inches, and to be properly riveted to them.

Engine room hatchways on the main deck are to be enclosed by iron trunk bulkheads, efficiently strengthened and extended from the main deck to the awning deck; and the comings to the engine room skylight not to be less than eighteen inches above the awning deck.

Rounded gunwale plating to be not less in thickness than required for the awning-deck stringer plate. The gunwale must be properly constructed to the satisfaction of the Surveyors.

The main deck stringer plate is to be fitted and connected to the sheerstrake by angle iron between the frames, of the size given for beam stringer angle iron; and in addition, an inner stringer angle iron of the same size, passing continuously fore and aft, must be riveted to reversed angle iron on each frame, and to the stringer plate; the space between this angle iron and the sheerstrake, all fore and aft, to be filled in and made watertight.

POOPS, TOP-GALLANT FORECASTLES, AND BRIDGE HOUSES.

Section 44. In full poops, top-gallant forecastles, and engine space enclosures, a reduction of one-fourth from the dimensions which would be required in the same range, if the vessel were flush decked, (exclusive of additions for extreme proportions) will be allowed in the outside plating, beams, stringer and tie-plates upon beams, angle iron on stringer plates, and flat of deck. In no case need the side plating exceed six-sixteenths of an inch in thickness, and it must not be less than five-sixteenths.

All frames to extend to the poop or forecastle stringer plate, or to the lower part of the curve when of a rounded form at the gunwale. The beams to be of the size given in Table G 3, and they are to be efficiently pillared. A beam to be placed at every alternate frame to scarp the main frames not less than eighteen inches, and to be properly riveted to them.

The rounded gunwale plating may be of the thickness required for the poop or forecastle stringer plates. The gunwale must be properly constructed to the satisfaction of the Surveyors.

If the poop does not extend beyond one-fourth the vessel's length from aft, tie-plates need not be fitted on their beams.

Where the poop exceeds one-fourth of the vessel's length, the upper deck stringer plate and sheerstrake are to be either increased in thickness or doubled, in way of the break, for a length of from twenty to thirty feet, or increased strength at this part may be obtained in any other way, if to the satisfaction of the Surveyors.

Where it is proposed to fit a poop or top-gallant forecastle to a vessel under 14 feet depth of hold, the plans are to be submitted for the consideration of the Committee.

Where bridge houses are fitted, the whole of the frames are to be extended to the height of the bridge deck, or be connected to the stringer plates by knees and bracket plates, and the gunwale angle iron made continuous. Where efficient partial bulkheads are fitted, the alternate frames only need extend to the height of the bridge deck.

RAISED QUARTER-DECKS.

Section 45. Side plating of raised quarter-decks may be one-sixteenth of an inch less in thickness than topside plating below it, if the topside plating be seven-sixteenths of an inch in thickness or more.

The frames in all cases, and the reversed angle irons on alternate frames, are to extend to the raised quarter-deck stringer plate.

The upper deck beam stringer plate is to maintain its breadth to the break of the quarter-deck, and then it may be gradually reduced in breadth until it terminates at the fourth frame abaft the break, and it is to be fitted and riveted to the outside plating. The upper deck sheerstrake is to extend to the stern. The front or break bulkhead of the raised quarter-deck is to be stiffened by a thwartship plate, of not less size than the upper deck beam tie-plates, and efficiently connected to it by angle iron; this thwartship plate is to receive the deck ends, and is to be supported by bracket plates, when not riveted to a beam.

Where the raised deck is less than one quarter of the vessel's length, a reduction of one-fifth from the thickness which would be required in the same range if the vessel were flush decked will be allowed in the stringer and tie-plates upon beams, and angle iron on stringer plates and the flat of the deck, but no such reduction is to be made where the length of the raised quarter-deck exceeds the above limits.

Where the raised deck exceeds one quarter of the vessel's length, the number and arrangement of the hold beams, beam stringers and stringers in hold, must be in accordance with the Rules for the increased depth of the vessel, and the height of the reversed angle irons on the frames is to be regulated by the number for scantlings which the increased depth would give. The main sheerstrake should be doubled, or increased in thickness, for a reasonable distance before and abaft the break; the side plating of the raised deck should be increased in thickness at the break, and be extended for some distance before the break; the butts of this plating, the main sheerstrake, and the strake of plating next below must be treble riveted in the neighbourhood of the break, and the butt-straps be one-sixteenth of an inch thicker than the plates they connect. The main deck stringer plate should extend abaft the break about seven frame spaces, and the raised deck stringer plate about four frame spaces before the break, and the stringer plates below the main deck should have a shift of about sixteen feet overlap, or the necessary strength may be obtained by other arrangements if approved by the Surveyors.

VESSELS OF EXTREME PROPORTIONS.

Section 46. In the following cases additional longitudinal strength, beyond that stated in the foregoing Rules, and in Tables G 1 and G 2, will be required. For stringer plates and iron decks, *see* Table G 4. *The length, breadth, and depth to be taken as per Section 1.*

VESSELS ABOVE 11 AND NOT EXCEEDING 12 DEPTHS IN LENGTH.

Plating Number under 18,700. The sheerstrake to be increased one-sixteenth of an inch in thickness for three-fourths the vessel's length amidships.

To have a bulb plate of the dimensions required for the midship beam plate, placed between, and riveted to, the double angle iron bilge keelson for one-half the vessel's length amidships.

To have one strake of plating at the bilges one-sixteenth of an inch thicker than prescribed in Table G 1, for one-half the vessel's length amidships.

Plating No. 18,700 and under 26,400. The sheerstrake to be increased one-sixteenth of an inch in thickness for three-fourths the vessel's length amidships.

To have a bulb plate of the dimensions of the midship beam plate, placed between, and riveted to, the double angle iron bilge keelson for three-fifths the vessel's length amidships.

And to have two strakes of plating at the bilge one-sixteenth of an inch thicker than given in Table G 1 for one-half the vessel's length amidships.

Plating No. 26,400 and under 35,200. The sheerstrake to be increased one-sixteenth of an inch in thickness for three-fourths the vessel's length amidships.

To have a bulb plate of the dimensions required for the midship beam plate, placed between, and riveted to, the double angle iron bilge keelson for three-fifths the vessel's length amidships.

To have also a bulb plate of the same size as the above, fitted to the side intercostal keelson for one-half the vessel's length amidships.

And to have an intercostal plate riveted between the upper bilge stringer angle irons, and attached to the outside plating for half the length of the vessel amidships.

Plating No. 35,200 and under 40,200. The sheerstrake to be increased one-sixteenth of an inch in thickness for three-fourths the vessel's length amidships.

To have a bulb plate of the dimensions required for the midship beam plate fitted to the side intercostal keelson for half the vessel's length amidships.

To have an intercostal bilge keelson fitted for half the vessel's length amidships, and attached to the outside plating.

And to have intercostal plates fitted between the upper bilge stringer angle irons, and attached to the outside plating for three-fifths the vessel's length amidships.

VESSELS ABOVE 12 AND NOT EXCEEDING 13 DEPTHS IN LENGTH.

Plating No. under 18,700. The sheerstrake to be increased in thickness two-sixteenths of an inch, for three-fourths the vessel's length amidships.

To have a bulb plate of the dimensions required for the midship beam plate, placed between, and riveted to, the double angle iron bilge keelson for three-fifths the vessel's length amidships.

To have two strakes of plating at the bilges one-sixteenth of an inch thicker than prescribed in Table G 1, for one-half the vessel's length amidships.

Plating No. 18,700 and under 26,400. The sheerstrake to be increased two-sixteenths of an inch in thickness for three-fourths the vessel's length amidships.

To have a bulb plate of the dimensions required for the midship beam plate, placed between, and riveted to, the double angle iron bilge keelson for three-fifths the vessel's length amidships.

And to have intercostal plates riveted between the upper bilge stringer angle irons, and attached to the outside plating for one-half the vessel's length amidships; or to have in lieu thereof three strakes of plating at the bilge one-sixteenth of an inch thicker than required by Table G 1 for the same length.

Plating No. 26,400 and under 35,200. The sheerstrake to be increased two-sixteenths of an inch in thickness for three-fourths the vessel's length amidships.

To have a bulb plate of the dimensions required for the midship beam plate, fitted to the side intercostal keelson for one-half the vessel's length amidships.

Also to have a bulb plate of the same size as the above, placed between, and riveted to, the double angle iron bilge keelson for three-fifths the vessel's length amidships.

And to have intercostal plates riveted between the upper bilge stringer angle irons and attached to the outside plating for one-half the vessel's length amidships.

Plating No. 35,200 and under 40,200. The sheerstrake to be increased in thickness two-sixteenths of an inch for three-fourths the vessel's length amidships.

To have a bulb plate of the dimensions required for the midship beam plate, fitted to the side intercostal keelson for one-half the vessel's length amidships.

To have intercostal plates fitted and attached to the outside plating at the bilge keelson for one-half the vessel's length amidships, and to have a bulb plate of the same size as that given above, attached thereto, and to the keelson angle irons, for three-fifths the vessel's length amidships.

To have intercostal plates riveted between the upper bilge stringer angle irons, and attached to the outside plating for three-fifths the vessel's length amidships.

VESSELS ABOVE 13 AND NOT EXCEEDING 14 DEPTHS IN LENGTH.

Plating No. under 10,450. The sheerstrake to be increased two-sixteenths of an inch in thickness for three-fourths the vessel's length amidships, and the strake next below it to be increased one-sixteenth of an inch for one-half the vessel's length amidships.

To have a bulb plate of the dimensions required for the midship beam plate, placed between and riveted to, the double angle iron bilge keelson for three-fifths the vessel's length amidships.

To have also an additional bulb plate of the same size as the above, fitted between the upper bilge stringer angle irons for one-half the length of the vessel amidships.

To have in all cases a side keelson formed of double angle irons, about midway between the bilge and middle line keelson.

And to have two strakes of plating at the bilges one-sixteenth of an inch thicker than prescribed in Table G 1 for one-half the vessel's length amidships.

Plating No. 10,450 and under 15,500. The sheerstrake to be doubled below the stringer plate with plates not less than 18 inches broad in long lengths, and of the thickness of topside plating, for three-fifths of the vessel's length amidships.*

To have a bulb plate of the dimensions required for the midship beam plate, placed between and riveted to, the double angle iron bilge keelson for three-fifths the vessel's length amidships.

To have also a side intercostal keelson fitted between double side keelson angle irons, and attached to the outside plating, extending as far forward and aft as practicable.

In addition to the above, two strakes of plating at the bilges are to be one-sixteenth of an inch thicker than given in Table G 1, for one-half the vessel's length amidships.

Plating No. 15,500 and under 18,700. The sheerstrake to be doubled below the stringer plate with plates not less than 20 inches broad, in long lengths, and of the thickness of the topside plating, for three-fifths the vessel's length amidships.

* When it is required to double the sheerstrake for a portion of its breadth, the topside strake may in lieu thereof be doubled its whole breadth for the same length.

To have a bulb plate of the dimensions required for the midship beam plate fitted to the bilge keelson for three-fifths the vessel's length amidships.

And to have intercostal plates riveted between the upper bilge stringer angle irons, and attached to the outside plating for one-half the vessel's length amidships; or in lieu thereof, three strakes of plating at the bilge are to be increased one-sixteenth of an inch in thickness beyond that required by Table G 1.

Plating No. 18,700 and under 26,400. The sheerstrake to be doubled below the stringer plate with plating not less than 20 inches broad, in long lengths, and of the thickness of the topside plating, for three-fifths the vessel's length amidships; or, where an iron upper deck is fitted for half the vessel's length amidships of the thickness given in Table G 4, the sheerstrake may be increased two-sixteenths of an inch in lieu of doubling.

To have a bulb plate of the dimensions required for the midship beam plate fitted to the bilge keelson for three-fifths of the vessel's length amidships.

And to have intercostal plates riveted between the upper bilge stringer angle irons and attached to the outside plating for one-half the vessel's length amidships.

Plating No. 26,400 and under 35,200. The sheerstrake to be two-sixteenths of an inch thicker, and the strake below it one-sixteenth of an inch thicker than required by Table G 1 for three-fourths the vessel's length amidships.

To have a bulb plate of the dimensions required for the midship beam plate fitted to the side intercostal keelson for one-half the vessel's length amidships.

To have intercostal plates fitted and riveted between the bilge stringer angle irons and attached to the outside plating for half the vessel's length amidships.

And to have intercostal plates riveted between the upper bilge stringer angle irons and attached to the outside plating for three-fifths the vessel's length amidships.

Plating No. 35,200 and under 40,200. The sheerstrake to be two-sixteenths of an inch thicker, and the strake below it one-sixteenth of an inch thicker than required by Table G 1 for three-fourths the vessel's length amidships.

To have a bulb plate of the dimensions required for the midship beam plate fitted to the side intercostal keelson for one-half the vessel's length amidships.

To have an intercostal bilge keelson attached to the outside plating for half the vessel's length amidships; and to have a bulb plate of the same size as that given above attached thereto, and to the keelson angle irons, for three-fifths the vessel's length amidships.

To have intercostal plates fitted between the upper bilge stringer angle irons and attached to the outside plating for one-half the vessel's length amidships.

The middle line keelson in these vessels to be one-fourth deeper than required by Table G 2 for one-half the vessel's length amidships, tapered forward and aft to the depth given in the Table.

VESSELS ABOVE 14 AND NOT EXCEEDING 15 DEPTHS IN LENGTH.

Plating No. under 10,450. The sheerstrake to be doubled its breadth below the stringer plate with plates not less than eighteen inches broad and of the thickness of the strake next below it, for three-fourths the vessel's length amidships.

To have a bulb plate of the dimensions required for the midship beam plate, fitted to the bilge keelson for three-fifths the vessel's length amidships.

To have a bulb plate of the same size as the above, fitted between the upper bilge stringer angle iron for one-half the vessel's length amidships.

To have in all cases a side keelson formed of double angle irons, about midway between the bilge and middle line keelson, with a bulb plate between of the size given above.

And to have an intercostal stringer fitted at the upper turn of bilge and attached to the outside plating for half the vessel's length amidships, or, in lieu thereof, one strake of plating at the bilge, doubled for the same length.

Plating No. 10,450 and under 15,500. The sheerstrake to be doubled, its breadth below the stringer plate, with plates not less than twenty inches broad and of the thickness of the strake next below it, for three-fourths the vessel's length amidships.

To have a bulb plate of the dimensions required for the midship beam plate fitted to the bilge keelson for three-fifths of the vessel's length amidships.

To have a side intercostal keelson attached to the outside plating extending as far forward and aft as practicable.

And to have intercostal plates fitted between the upper bilge stringer angle irons and attached to the outside plating for one half the vessel's length amidships; or in lieu thereof to have one strake of plating at the bilge doubled for one-half the vessel's length amidships.

Plating No. 15,500 and under 18,700. The sheerstrake to be doubled, its breadth below the stringer plate, with plates not less than twenty-four inches broad and of the thickness of the strake next below it, for three-fourths the length of the vessel amidships.

To have a bulb plate of the dimensions required for the midship beam plate, fitted to the bilge keelson for three-fifths the vessel's length amidships.

To have intercostal plates riveted between the upper bilge stringer angle irons and attached to the outside plating for one-half the vessel's length amidships; or in lieu thereof one strake of plating at the bilge to be doubled for the same length.

Plating No. 18,700 and under 26,400. The sheerstrake to be doubled, its breadth below the stringer plate, with plates not less than twenty-four inches broad and of the thickness of the strake next below it, for three-fourths the vessel's length amidships.

To have a bulb plate of the dimensions required for the midship beam plate, fitted to the bilge keelson for three-fifths of the vessel's length amidships.

Also to have a bulb plate, of the same size as the above, fitted to the side intercostal keelson for one-half the vessel's length amidships.

And to have intercostal plates riveted between the upper bilge stringer angle irons and attached to the outside plating for one-half the vessel's length amidships.

Plating No. 26,400 and under 35,200. The sheerstrake to be doubled, its breadth below the stringer plate, with plates not less than twenty-four inches broad and of the thickness of the strake next below it, for three-fourths the vessel's length amidships.

To have a bulb plate of the dimensions required for the midship beam plate, fitted to the side intercostal keelson for one-half the vessel's length amidships.

To have an intercostal plate fitted and riveted between the bilge keelson angle irons, and attached to the outside plating for three-fifths the vessel's length amidships, with a bulb plate, of the size given above, attached thereto, and extending two-thirds the length of the vessel amidships.

To have an intercostal plate riveted between the upper bilge stringer angle irons and attached to the outside plating for three-fifths the vessel's length amidships.

The middle line keelson to be one-fourth deeper than required by Table G 2, for one-half the vessel's length amidships, tapered forward and aft to the depth given in the Table.

Plating No. 35,200 and under 40,200. The sheerstrake to be doubled, its breadth below the stringer plate, with plates not less than twenty-four inches broad and of the thickness of the strake next below it, for three-fourths the vessel's length amidships.

To have a bulb plate of the dimensions required for the midship beam plate, fitted to the side intercostal keelson for one-half the vessel's length amidships.

To have an intercostal bilge keelson attached to the outside plating for three-fifths the vessel's length amidships, with a continuous plate keelson standing on the floors, and attached to the intercostal plates, having double angle irons on its upper and lower edges, of the size given in Table G 2, for keelson angle irons. The continuous plate keelson to be in depth sufficient to take the double angle irons on top and bottom, and to be the same thickness as that given in Table G 2 for middle line keelsons, and to extend for one-half the vessel's length amidships.

To have intercostal plates fitted between the upper bilge stringer angle irons and attached to the outside plating for three-fifths the vessel's length amidships.

The middle line keelson in these vessels to be one-fourth deeper than required by Table G 2 for half the length amidships, tapered forward and aft to the depth given in the Table.

VESSELS ABOVE 15 AND NOT EXCEEDING 16 DEPTHS IN LENGTH.

Plating No. under 15,500. The sheerstrake to be doubled, its breadth below the stringer plate, with plates not less than ~~twenty~~ inches broad and of the thickness of the strake next below it, for three-fourths of the vessel's length amidships.

To have a bulb plate of the dimensions required for the midship beam plate, fitted to the bilge keelson for three-fifths the vessel's length amidships.

To have a side intercostal keelson attached to the outside plating, extending as far forward and aft as practicable.

To have intercostal plates fitted between the upper bilge stringer angle irons, and attached to the outside plating for one-half the vessel's length amidships, or in lieu thereof to have one strake of bilge plating doubled for one-half the length amidships.

Plating No. 15,500 and under 18,700. The sheerstrake to be doubled, its breadth below the stringer plate, with plates not less than twenty-four inches broad and of the thickness of the strake next below it, for three-fourths the length of the vessel amidships.

To have, in addition to the side intercostal keelson, intercostal plates fitted between the bilge keelson angle irons and attached to the outside plating for three-fifths the vessel's length amidships.

To have also intercostal plates riveted between the upper bilge stringer angle irons, and attached to the outside plating for one-half the vessel's length amidships; or in lieu thereof one strake of plating at the bilge, to be doubled for the same length.

Plating No. 18,700 and under 26,400. The sheerstrake to be doubled, its breadth below the stringer plate, with plates not less than twenty-four inches broad and of the thickness of the strake next below it, for three-fourths the vessel's length amidships.

To have a bulb plate of the dimensions required for the midship beam plate fitted to the side intercostal keelson for one-half the vessel's length amidships.

To have intercostal plates fitted and riveted between the bilge keelson angle irons, and attached to the outside plating for half the vessel's length amidships, with a bulb plate of the size given above attached thereto, and extending three-fifths the length of the vessel amidships.

To have intercostal plates riveted between the upper bilge stringer angle irons and attached to the outside plating for three-fifths the vessel's length amidships.

The middle line keelson to be one-fourth deeper than required by Table G 2 for half the vessel's length amidships, tapered forward and aft to the depth given in the Table.

Plating No. 26,400 and under 35,200. The sheerstrake to be doubled, its breadth below the stringer plate, with plates not less than twenty-four inches broad and of the thickness of the strake next below it, for three-fourths the vessel's length amidships.

To have a bulb plate, of the size required for the midship beam plate, fitted to the side intercostal keelson, for one-half the vessel's length amidships.

To have an intercostal bilge keelson attached to the outside plating for three-fifths the vessel's length amidships, with a bulb plate of the size given above attached thereto for three-fifths the vessel's length amidships.

To have intercostal plates fitted between the upper bilge stringer angle irons and attached to the outside plating for three-fifths the vessel's length amidships.

The middle line keelson to be one-fourth deeper than required by Table G 2, for half the vessel's length amidships, tapered forward and aft to the depth given in the Table.

Plating No. 35,200 and under 40,200.* The sheerstrake to be doubled, its breadth below the stringer plate, with plates not less than twenty-four inches broad and of the thickness of the strake next below it, for three-fourths the vessel's length amidships.

To have a bulb plate of the dimensions required for the midship beam plate fitted to the side intercostal keelson for one-half the vessel's length amidships.

To have an intercostal bilge keelson attached to the outside plating for three-fifths the vessel's length, with a continuous plate keelson standing on the floors and attached to the intercostal, having double angle irons on its upper and lower edges, of the size given in Table G 2 for keelson angle irons. The continuous plate keelson to be three-fourths the depth and the same thickness as given in Table G 2 for middle line keelsons, and to extend for one-half the vessel's length amidships.

To have intercostal plates fitted between the upper bilge stringer angle irons and attached to the outside plating for three-fifths the vessel's length amidships.

The middle line keelson in these vessels to be one-fourth deeper than required by Table G 2, for half the vessel's length amidships, tapered forward and aft to the depth given on the Table.

For all VESSELS EXCEEDING SIXTEEN DEPTHS IN LENGTH to the Main or Middle Deck, and Vessels the Plating No. of which is above 30,000 and which exceed thirteen depths in length to the Upper Deck, plans must be submitted for the approval of the Committee for giving the Vessel sufficient additional strength longitudinally.

VESSELS NOT BUILT UNDER SURVEY.

Section 47. In cases of vessels not surveyed while building, for which a character may be required, application must be made to the Committee in writing, who will direct a special examination to be made by two Surveyors of the Society (one of whom shall be an exclusive officer), for which purpose the vessel is to be placed on high blocks in a dry dock or on ways; the hold to be cleared and proper stages made; the rivets and

* All vessels, excepting those with either awning deck or spar deck, whose plating number exceeds 35,200 and exceeding 16 depths in length taken from the main deck, are to have the whole of the reverse frames extended to the gunwale for half the vessel's length amidships, or a sufficient number of partial bulkheads fitted in the 'tween decks to the approval of the Committee.

plating of keel, and flat of bottom, thoroughly examined; the close ceiling in the hold to be removed where deemed necessary, and coal bunkers of steam vessels to be cleared; the whole of the frames, stringers, hooks, floor-plates, keelsons, engine and boiler bearers, ends of beams, watertight bulkheads, rivets, and inner surface of the plating exposed to view;* all oxidation to be removed by being cut or beaten off the several parts above named, also from the outside plating, rivets, keel, stem, sternpost, and rudder; and the planksheers and waterways, if of wood, to be scraped bright. When the vessel is so prepared, the Surveyors are to ascertain by drilling the thickness of the plating in such parts as they may deem necessary, also the condition of all the parts of iron above named, and of the planksheers, waterways, flat of decks and their fastenings; and send a detailed report thereon, stating the dimensions and quality of the materials and workmanship, to the Committee, who will then assign the vessel such character as the facts may appear to them to warrant.

In addition to the above, the Special Surveys Nos. 1, 2, and 3 described on page 4 of the Rules must be complied with, regulated by the age of the vessel, as in the case of vessels built under survey, and the periodical surveys are also to be held as in the case of vessels built under survey.

* In cases where the inner surface of the bottom plating is coated with cement or asphalt, if the coating be carefully inspected, and tested by beating or chipping, and found sound and adhering satisfactorily to the iron, its removal may be dispensed with, provided that upon the removal of a portion, the plating, frames, and rivets under it be found in satisfactory condition.

IRON SHIPS

CLASSED UNDER REGULATIONS PREVIOUSLY PASSED FOR THE BUILDING AND CLASSIFICATION OF IRON SHIPS.

All vessels will be classed **A** so long as on careful annual and periodical *special* surveys they are found to be in a fit and efficient condition to carry dry and perishable cargoes to and from all parts of the world.

Differences of construction, as regards thickness of plating, strength, and probable durability, &c., will be indicated by the letters A, B, and C placed inside the letter **A**,—thus, **A** **B** **A**.

A **B** will denote that the vessels have been built in accordance with, or equal to, the Rules and Table G.

A will denote vessels which are considered entitled to the **A** character, but which have not been built in accordance with the Rules.

All vessels to be subject to occasional or annual survey when practicable.

To entitle Ships to retain their respective characters in the Register Book, the following Special Surveys must be held periodically:—

Survey No. 1.—The vessel to be placed on blocks of sufficient height in a dry dock, or on ways; the limber boards, and ceiling equal to one strake fore and aft on each side removed, with both surfaces of outside plating exposed.*

If the vessel has a double bottom, the same must be tested by a head of water to the height of the light water-line to test its efficiency.

Survey No. 2.—The vessel to be placed on blocks of sufficient height in a dry dock, or on ways; the limber boards, and ceiling equal to *three* strakes fore and aft on each side removed, with both surfaces of outside plating exposed.*

The windlass at this and all subsequent alternate special surveys to be unhung where necessary, and its wood linings sufficiently stripped, for examination. The chain cables are also to be ranged for inspection.

If the vessel has a double bottom, the same must be tested by a head of water to the height of the light water-line to test its efficiency.

After a vessel has passed No. 3 Survey, in addition to the survey prescribed for No. 2, when that survey becomes due ceiling should be lifted at other parts of the vessel where deemed necessary by the Surveyors to enable them to satisfy themselves as to the condition of the inside of the vessel.

Survey No. 3 BY TWO SURVEYORS, ONE TO BE AN EXCLUSIVE OFFICER OF THE SOCIETY.—The vessel to be placed on blocks of sufficient height, in a dry dock, or upon ways; proper stages to be made and the hold to be cleared; all the close ceiling in the hold to be removed, so that the rivets and plates of keel, and flat of bottom may be thoroughly examined; coal-bunkers of steam vessels to be cleared, the whole of the frames, stringers, hooks, floor-plates, keelsons, engine and boiler bearers,† ends of beams, water-tight bulkheads, rivets, and inner surface of the plating to be exposed;* all oxidation to be removed by being cut

* In cases where the inner surface of the bottom plating is coated with cement or asphalt, if a sufficient quantity of ceiling be removed to enable the coating to be carefully inspected and tested by beating or chipping, and the coating be found sound and good and adhering satisfactorily to the iron, the removal of such coating will be dispensed with. Ships which have undergone the above examination will be noted in the Register Book thus, *s.s.No.1-68, s.s.No.2-68, s.s.No.3-68*; and if not submitted to such Survey, will be liable to have their character suspended.

† Whenever the engines and boilers are taken out for repair, the engine and boiler bearers, with the floor-plates, keelsons, rivets, &c., under them may, at the request of the owners, be surveyed in anticipation of the above Rule.

or beaten off the several parts above named, also from the outside plating, rivets, keel, stem, sternpost, and rudder, so as to completely lay bare all the surfaces of iron; the planksheers and waterways, if of wood, to be scraped bright. When the vessel is thus prepared, the Surveyors, if they deem necessary, are to ascertain the thickness of the plating by having holes drilled.

Such parts as may be found defective, or less than three-fourths of the required substance by Rule, are to be removed and replaced with proper materials, equal in substance and quality to the original construction. The planksheers, waterways, flat of decks and their fastenings, are also to be examined and made good where necessary.

If the vessel has a double bottom, the same must be tested by a head of water to the height of the light water-line to test its efficiency.

Whenever the bottom plating is to be cemented, a survey is to be held prior to the cement being laid.

Every ship classed **A** or **B** must be submitted to a *special periodical survey* every *four* years:—the first survey according to No. 1; the second according to No. 2; the third according to No. 3; and afterwards according to Nos. 1, 2, and 3 consecutively at intervals of four years.

Every ship classed **A** must be submitted to a special periodical survey every *three* years, as per Nos. 1, 2, and 3, afterwards Nos. 1, 2, and 3 consecutively.

In all vessels classed **B** and above, No. 3 Survey must be complied with before the expiration of thirteen years from the date of build, or the previous No. 3 Survey. In all vessels classed **A**, No. 3 Survey must be complied with before the expiration of ten years from the date of build, or the previous No. 3 Survey.

RULES FOR THE SURVEY OF IRON SHIPS CLASSED FOR PERIODS OF YEARS.

All vessels thus classed to be subject to occasional or annual survey when practicable, and *every third year to be specially surveyed* in dry dock or laid on blocks, with both surfaces of outside plating exposed;* and whenever the engines or the boilers of iron steam ships are taken out, the vessel shall be submitted to a particular and special survey.

CONTINUATION OF IRON SHIPS TO THE CHARACTER **A**.

If, on the termination of the period of original designation, or if at any subsequent period, not exceeding one-half the number of years assigned originally, or on Restoration, an Owner shall wish to have his ship remain or be replaced on the letter **A**, he is to send a written notice thereof to the Secretary, and the Committee shall then direct a special survey, as follows, to be held by not less than two competent persons, to be appointed by the Committee, one of them to be a Surveyor the exclusive servant of the Society.

* In cases where the inner surface of the bottom plating is coated with cement or asphalte, if a sufficient quantity of ceiling be removed to enable the coating to be carefully inspected, and tested by beating or chipping, and the coating be found sound and good and adhering satisfactorily to the iron, the removal of such coating will be dispensed with. Ships which have undergone the above examination will be noted in the Register Book, thus, *t.s.*; and if not submitted to such triennial Survey, will be liable to have their character suspended.

SURVEY.

The vessel to be placed on high blocks, in a dry dock, or upon ways, and proper stages to be made, so that the rivets and plates of keel, and flat of bottom, may be thoroughly examined; the whole of the ceiling or lining inside to be entirely removed; coal bunkers of steam vessels to be cleared, so as to expose the whole of the frames, stringers, hooks, floor-plates, keelsons, engine and boiler bearers, ends of beams, watertight bulkheads, rivets, and inner surface of the plating, to view; the hold to be cleared; all oxidation to be removed by being cut or beaten off the several parts above named, also from the outside plating, rivets, keel, stem, sternpost, and rudder, so as to completely lay bare all the surfaces of iron;* the planksheers and waterways, if of wood, to be scraped bright; and when the vessel is thus prepared, the Surveyors are to ascertain the thickness of the plating by having, if they deem necessary, holes drilled therein, also the condition of all the parts of iron above-named, and of the planksheers, waterways, flat of decks and their fastenings; and upon the Owner consenting to remove and replace with proper materials, equal in substance and quality to the original construction such parts as may be found defective, or less than three-fourths of the required substance by Rule, such vessel, upon the repairs and efficiency being reported to the Committee, may be Continued on the letter **A** for a term of years not exceeding one-half the number of years assigned originally, or on Restoration, subject to occasional or annual survey when practicable. The period of Continuation will, upon all occasions, commence from the time the ship may have gone off the letter **A**, without regard to the date when the survey for this purpose may be held.

RESTORATION OF IRON SHIPS TO THE CHARACTER **A**.

If, *at any age of a vessel*, an Owner be desirous to have his ship Restored, such Restoration, on his application to the Committee, and consenting to the special survey hereinafter described, to be held by two Surveyors, one of whom shall be an exclusive servant of the Society, and performing the repairs thereby found requisite, will be granted for a period not exceeding two-thirds of the time originally assigned, the same to be calculated from the date of such repairs.

SURVEY AND REQUISITES FOR RESTORATION.

The vessel to be placed on high blocks, in a dry dock, or upon ways, and proper stages to be made, so that the rivets and plates of keel, and flat of bottom, may be thoroughly examined; the whole of the ceiling or lining inside to be entirely removed; coal bunkers of steam-vessels to be cleared, the boilers to be taken out and also the engines (unless it shall be shown by previous survey that the removal is unnecessary), so as to expose the whole of the frames, stringers, hooks, floor-plates, keelsons, engine and boiler bearers, ends of beams, watertight bulkheads, rivets, and inner surface of the plating, to view; the hold to be cleared; all oxidation to be removed by being cut or beaten off the several parts above-named, also from the outside

* In cases where the inner surface of the bottom plating is coated with cement or asphalte, if a sufficient quantity of ceiling be removed to enable the coating to be carefully inspected, and tested by beating or chipping, and the coating be found sound and adhering satisfactorily to the iron, the removal of such coating will be dispensed with. Ships which have undergone the above examination will be noted in the Register Book, thus, *i.e.*; and if not submitted to such triennial Survey, will be liable to have their character suspended.

plating, rivets, keel, stem, sternpost, and rudder, so as to completely lay bare all the surfaces of iron;* the planksheers and waterways, if of wood, to be entirely removed, and also the flat of upper deck, except under special circumstances, to be sanctioned by the Committee in each case: and when the vessel is thus prepared, the Surveyors are to ascertain the thickness of the plating by having, if they deem necessary, holes drilled therein, also the condition of all the parts of iron above-named, and of the beams and their fastenings; and upon the Owner consenting to remove such parts as may be found defective, or objected to, or less in thickness than hereinafter admitted for repairing such vessel, and replace them with proper materials equal in quality and substance to that required in the Table G for the nine years' grade in those originally classed 12 A, and equal in quality and substance to that required in the Table G for the six years' grade in vessels originally classed 9 A or 6 A, such vessel, upon the repairs and efficiency being reported to the Committee, may be restored to the letter A, for a term of years not exceeding two-thirds the number of years assigned originally, subject to occasional survey.

Iron ships which have been Restored under the foregoing Rule shall be entitled to Continuation thereon, subject to the same conditions of survey and examination as are prescribed for ships proposed to be Continued at the expiration of the period first assigned to them; but, in like manner, the term of such extended continuance to be limited to a period not exceeding one-half the number of years for which the ships may respectively have been restored, without reference to the period originally assigned to them.

IRON SHIPS ALREADY CLASSED A1.

Iron ships built prior to the promulgation of the Rules will be allowed to remain in the Register Book classed A1 from year to year, *subject to annual survey*, until the expiration of Six Years from their date of build, and then be examined to determine the period to which they may be entitled under the Rules; and if, on such examination, it shall be found the ships are entitled to the 9 or 12 years' grade, it will be in the option of the Owners either to adopt such periods respectively, or continue the vessel A1 from year to year, as above, until the expiration of the extended period; but if it shall be found that the term of years for which a vessel would have been entitled to remain on the A character has expired, she will be classed AE, if entitled thereto, unless specially surveyed for Continuation or for Restoration.

* In cases where the inner surface of the bottom plating is coated with cement or asphalte, if a sufficient quantity of ceiling be removed to enable the coating to be carefully inspected, and tested by beating or chipping, and the coating be found sound and good and adhering satisfactorily to the iron, the removal of such coating will be dispensed with.

By order of the Committee,

BERNARD WAYMOUTH,

Secretary.

No. 2, WHITE LION COURT, CORNHILL,
LONDON, 1st July, 1875.

LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING.

RULES AND REGULATIONS.

IRON SHIPS.

With reference to notice No. 248, announcing the Committee's Resolution of the 6th January, to allow, in the case of Iron Ships (not being Spar-decked Ships) built in conformity with the Rules in other respects for the Δ Class, a *reduction of one-sixteenth of an inch* in the thickness of outside plating for all parts from that heretofore prescribed in Table G attached to the Rules, and that Iron Ships which had been built upon the Rules hitherto in force, and classed Δ , should be distinguished in the Register Book by an asterisk prefixed, thus * Δ .

NOTICE is hereby given that in pursuance of a Resolution passed by the Committee this day, Ships only which may be built in conformity with the Rules for the Δ character in force prior to the 6th January, 1870, will be allowed that character, and will have an asterisk prefixed, thus * Δ . All other Iron Ships will be classed in accordance with the New Rules 100 Δ , 90 Δ , 80 Δ , or their intermediates.

The foregoing Resolution will apply to all Iron Ships built or contracted for after this date.

By order of the Committee,

GEORGE B. SEYFANG,

Secretary.

No. 2, White Lion Court, Cornhill, London, E.C.,
28th April, 1870.

NAVY REGISTER OF BRITISH AND FOREIGN SHIPPING

RULES AND REGULATIONS

IRON SHIPS

It is referred to notice No. 213, announcing the Committee's Resolution of the 1st January to allow a class of Iron Ships (not being Steam-driven Ships) built in conformity with the Rules in other respects, and classed a reduction of one-sixth of an inch in the thickness of outside plating for all parts from the thickness prescribed in Table C attached to the Rules and that Iron Ships which had been built upon other standards in force and classed Δ , should be distinguished in the Register Book by an asterisk Δ^* .

NOTICE is hereby given that in pursuance of a Resolution passed by the Committee (10th Dec. 1870) which may be built in conformity with the Rules for the Δ class in force prior to the 1st January, 1871, will be allowed that character and will have an asterisk prefixed thus Δ^* . All other Iron Ships will be in accordance with the New Rules 100 Δ , 90 Δ , 80 Δ , or their intermediate.

The foregoing Resolution will apply to all Iron Ships built or completed for after this date.

In order of the Committee

GEORGE J. SELWYN

Secretary

Printed by the Navy Office, London, E.C.
1871

IR

KHEADS, OUTSIDE PLATING, PILLARS, &c.

OF OUTSIDE PLATING FOR HALF-LENGTH AMIDSHIPS.

From Garboard to the lower edge of sheerstrake.*

Sheerstrake
for
all grades.

From
main to
upper
sheer-
strakes in
Spar
decked
vessels.

										Sizes.
22	23	24	25	26	27	28	29	30	31	32
$\frac{9}{16}$	$\frac{9}{16}$	$\frac{9}{16}$	$\frac{9}{16}$	$\frac{10}{16}$	$\frac{10}{16}$	$\frac{10}{16}$	$\frac{10}{16}$	$\frac{10}{16}$	$\frac{10}{16}$	$\frac{10}{16}$

vessels which exceed this proportion, see Section 46. For proportions of

$\frac{14}{16}$

$\frac{15}{16}$

$\frac{16}{16}$

1 Inch.

13 Inches.

19 „

Rivets to be $\frac{1}{4}$ of an
inch larger in diameter
in the stem, stern-post
and keel.

inch thick, they should be secured to the Beams with $\frac{3}{4}$ of an inch rivets.

LLOYD'S

NAVY REGISTER OF BRITISH AND FOREIGN SHIPPING

RULES AND REGULATIONS

IRON SHIPS

It is referred to notice No. 213, announcing the Committee's Resolution of the 1st January to allow a class of Iron Ships (not being Steam-driven Ships) built in conformity with the Rules in other respects, and a reduction of one-sixth of an inch in the thickness of outside plating for all parts from the thickness prescribed in Table C attached to the Rules and that Iron Ships which had been built upon other standards in force and classed Δ , should be distinguished in the Register Book by an asterisk Δ^* .

NOTICE is hereby given that in pursuance of a Resolution passed by the Committee (10th Dec. 1870) which may be built in conformity with the Rules for the Δ class in force prior to the 1st January, 1871, will be allowed that character and will have an asterisk prefixed thus Δ^* . All other Iron Ships will be in accordance with the New Rules 100 Δ , 90 Δ , 80 Δ , or their intermediate.

The foregoing Resolution will apply to all Iron Ships built or completed for after this date.

In order of the Committee

GEORGE J. SELWYN

Secretary

Printed by the Navy Office, London, E.C.
1871

IRON VESSELS.

TABLE G. 1.

TABLE OF MINIMUM DIMENSIONS OF KEELS, STEMS, STERN POSTS, FRAMES, REVERSED FRAMES, FLOOR PLATES, BULKHEADS, OUTSIDE PLATING, PILLARS, &c.

NUMBERS. For Frames, Reversed Frames, Bulkheads, and Pillars.			SPACING OF FRAMES.	FRAMES FOR ALL GRADES.			Bulk- heads.	Diameter of solid pillars to beams.		NUMBERS. For Keel, Stem, Sternpost, and Plating.	KEEL. FOR ALL GRADES.	Stem and Stern-post for all grades.	THICKNESS OF OUTSIDE PLATING FOR HALF-LENGTH AMIDSHIPS.		From main to upper sheer- strakes in Spar decked vessels. — all grades.			
				Dimensions of angle iron for three- fifths the length of vessel amidships.	Dimensions of angle iron before and abaft the three-fifths length.	Dimensions of angle iron for Reversed frames, and bulkheads, for all grades.		Hold.	Deck.				Garboard Strakes.	From Garboard to the lower edge of sheerstrake.*			Sheerstrake for all grades.	
														100A		90A AND 80A		100A
31.5 and 37	In Vessels where the numbers in Table G 1 are under 5200, the space of the frames from centre to centre is not to exceed 20 inches; where they are 5200 and under 8900, the space may be 21 inches; where the numbers are 8900 and under 13100, the space may be 22 inches; when 13100, and under 16600, the space may be 23 inches; and when 16600 and above, it may be 24 inches.	inches. 2½ × 2½ × 5/16	inches. 2½ × 2½ × 5/16	inches. 2¼ × 2¼ × 4/16	inches. 4/16	inches. —	inches. 2¼	2600 and 3400	inches. 6 × 1⅛	inches. 5½ × 1⅛	inches. 30 × 6/16	inches. 6/16	inches. 5/16 & 6/16	inches. 5/16	inches. 4/16 & 5/16	inches. 30 × 6/16		
37 and 45		3 × 2½ × 5/16	3 × 2½ × 5/16	2½ × 2½ × 4/16	4/16	—	2½	3400 and 5200	6¾ × 1¼	6 × 1¼	" × 7/16	6/16	6/16	5/16 & 6/16	5/16	" × 7/16		
45 and 52		3 × 3 × 6/16	3 × 3 × 5/16	2½ × 2½ × 5/16	4/16	2½	2⅜	5200 and 7200	7 × 1⅝	6¼ × 1⅝	" × 8/16	7/16	6/16 & 7/16	6/16	5/16 & 6/16	" × 8/16		
52 and 57		3½ × 3 × 6/16	3½ × 3 × 5/16	3 × 2½ × 5/16	5/16	2⅝	2⅜	7200 and 8900	7¼ × 1⅞	6½ × 1⅞	" × 9/16	8/16	7/16	6/16 & 7/16	6/16	33 × 9/16		
57 and 61		3½ × 3 × 7/16	3½ × 3 × 6/16	3 × 2½ × 6/16	5/16	2¾	2½	8900 and 10450	7½ × 2⅛	6¾ × 2⅛	32 × 9/16	8/16	7/16 & 8/16	7/16	6/16 & 7/16	" × 10/16		
61 and 65		4 × 3 × 7/16	4 × 3 × 6/16	3 × 3 × 6/16	6/16	2⅞	2½	10450 and 11800	7½ × 2¼	7 × 2¼	" × 9/16	8/16	8/16	7/16 & 8/16	7/16	" × 10/16		
65 and 68		4 × 3 × 7/16	4 × 3 × 6/16	3 × 3 × 6/16	6/16	3	2½	11800 and 13100	8 × 2⅜	7 × 2⅜	" × 10/16	9/16	8/16 & 9/16	8/16	7/16 & 8/16	36 × 10/16		
68 and 71		4½ × 3 × 7/16	4½ × 3 × 6/16	3 × 3 × 7/16	6/16	3⅛	2½	13100 and 14300	8 × 2⅜	7¼ × 2⅜	34 × 10/16	9/16	9/16	8/16 & 9/16	8/16	" × 11/16	7/16	
71 and 73		4½ × 3 × 8/16	4½ × 3 × 7/16	3 × 3 × 7/16	6/16	3¼	2½	14300 and 15500	8 × 2⅜	7½ × 2⅜	" × 11/16	10/16	9/16 & 10/16	9/16	8/16 & 9/16	" × 11/16	7/16	
73 and 76		5 × 3 × 8/16	5 × 3 × 7/16	3 × 3 × 7/16	6/16	3⅜	2½	15500 and 16600	8½ × 2½	8 × 2½	" × 11/16	10/16	9/16 & 10/16	9/16	8/16 & 9/16	" × 12/16	7/16	
76 and 80		5 × 3 × 8/16	5 × 3 × 7/16	3½ × 3 × 8/16	7/16	3⅜	2⅝	16600 and 18700	9 × 2½	8½ × 2½	36 × 11/16	10/16	10/16	9/16 & 10/16	9/16	40 × 12/16	8/16	
80 and 85		5 × 3½ × 8/16	5 × 3½ × 7/16	3½ × 3½ × 8/16	7/16	3½	2⅝	18700 and 21700	9½ × 2½	9 × 2½	" × 12/16	11/16	10/16 & 11/16	10/16	9/16 & 10/16	" × 13/16	8/16	
85 and 92		5½ × 3½ × 8/16	5½ × 3½ × 7/16	3½ × 3½ × 8/16	7/16	3½	2⅝	21700 and 26400	10 × 2¾	10 × 2¾	" × 12/16	11/16	11/16	10/16 & 11/16	10/16	" × 13/16	8/16	
92 and 99		5½ × 3½ × 9/16	5½ × 3½ × 8/16	4 × 3½ × 8/16	7/16	3⅝	2⅝	26400 and 30900	11 × 2¾	11 × 2¾	" × 12/16	12/16	11/16 & 12/16	11/16	10/16 & 11/16	" × 13/16	8/16	
99 and 104		6 × 3½ × 9/16	6 × 3½ × 8/16	4 × 3½ × 9/16	7/16	3⅝	2⅝	30900 and 35200	11 × 3	11 × 3	" × 13/16	12/16	12/16	11/16 & 12/16	11/16	" × 13/16	8/16	
104 and 115	6 × 3½ × 10/16	6 × 3½ × 9/16	4½ × 3½ × 9/16	7/16	3¾	2⅝	35200 and 40200	11 × 3¼	11 × 3¼	" × 14/16	12/16	12/16 & 13/16	12/16	11/16 & 12/16	" × 14/16	9/16		

*In the columns for plating, where two thicknesses are given, they are to be worked in alternate strokes, and the large thickness is to apply to the outer strokes, and the smaller one to the inner strokes: and the size of the rivets and double riveting to be regulated by the thickness of the thicker plating, except where $\frac{1}{16}$ and $\frac{1}{8}$ outside plating is used alternately, when $\frac{3}{4}$ of an inch rivets may be used.

TABLE FOR SIZES OF FLOORS. See SECTION 7.

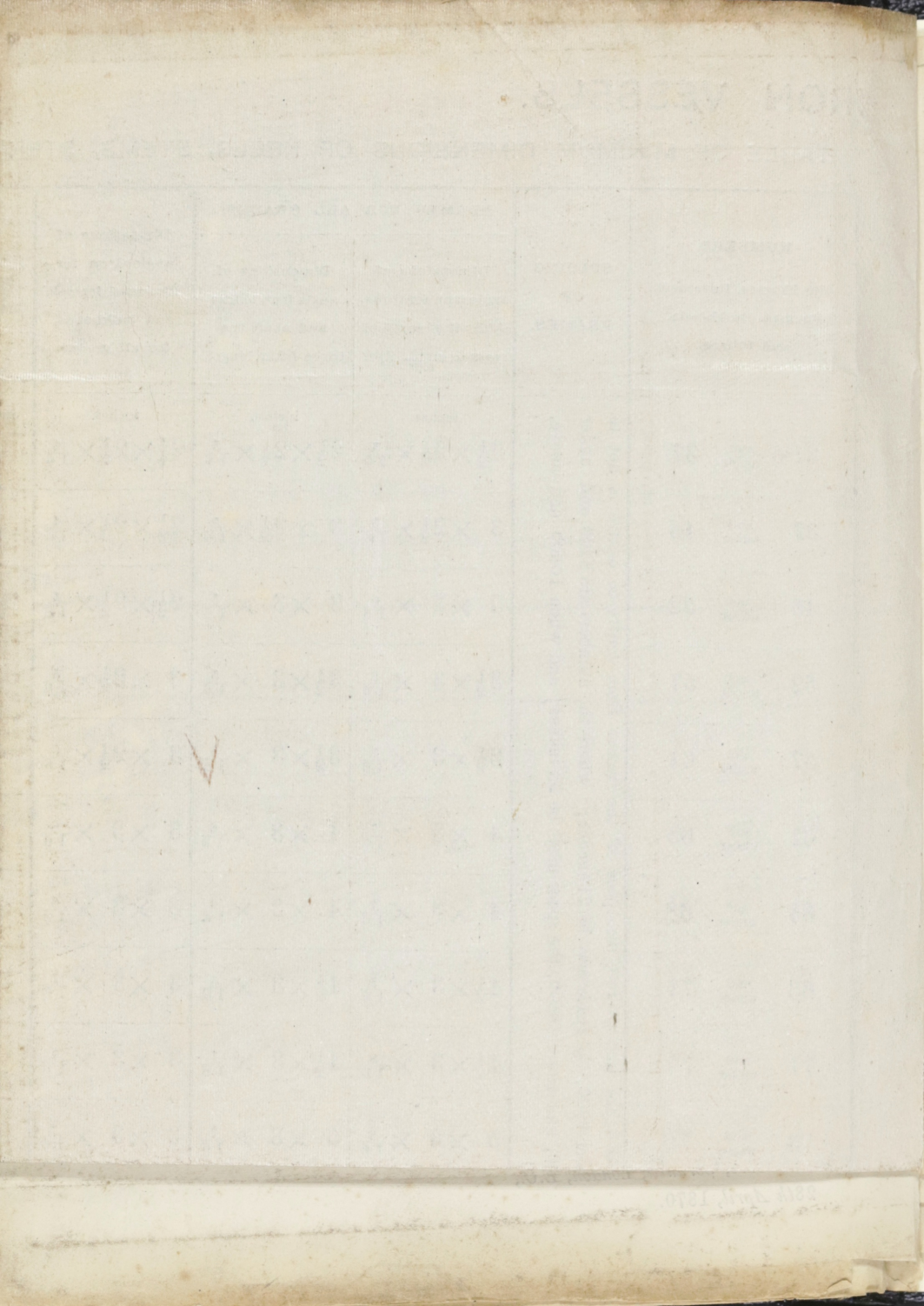
Floor plates under the *Engines and Boilers* of Steam Vessels to be one-sixteenth of an inch thicker than given in this Table, where the plates are nine-sixteenths of an inch and under.

NUMBERS FOR FLOORS.	31 to under 32	32 to 33	33 to 34	34 to 35	35 to 37	37 to 39	39 to 41	41 to 43	43 to 45	45 to 47	47 to 49	49 to 51	51 to 52	52 to 53	53 to 55	55 to 56	56 to 57	57 to 58	58 to 59	59 to 60	60 to 62	62 to 63	63 to 64	64 to 65	65 to 66	66 to 67	67 to 68	68 to 69	69 to 70	70 to 71	71 to 72	72 to 73	73 to 74	74 to 76	76 to 78	78 to 80	80 to 84	84 to 88	88 to 92	92 to 98	98 to 107	107 to 115	NUMBERS FOR FLOORS.
Sizes.	9 × 4 1 ⁶ / ₈	9 ¹ / ₂ × 4 1 ⁶ / ₈	10 × 4 1 ⁶ / ₈	10 ¹ / ₂ × 4 1 ⁶ / ₈	11 × 4 1 ⁶ / ₈	11 ¹ / ₂ × 4 1 ⁶ / ₈	12 × 4 1 ⁶ / ₈	12 ¹ / ₂ × 4 1 ⁶ / ₈	13 × 4 1 ⁶ / ₈	13 ¹ / ₂ × 4 1 ⁶ / ₈	14 × 4 1 ⁶ / ₈	14 ¹ / ₂ × 4 1 ⁶ / ₈	15 × 4 1 ⁶ / ₈	15 ¹ / ₂ × 4 1 ⁶ / ₈	15 ¹ / ₂ × 4 1 ⁶ / ₈	16 × 4 1 ⁶ / ₈	16 ¹ / ₂ × 4 1 ⁶ / ₈	17 × 4 1 ⁶ / ₈	17 ¹ / ₂ × 4 1 ⁶ / ₈	17 ¹ / ₂ × 4 1 ⁶ / ₈	18 × 4 1 ⁶ / ₈	18 ¹ / ₂ × 4 1 ⁶ / ₈	19 × 4 1 ⁶ / ₈	19 ¹ / ₂ × 4 1 ⁶ / ₈	20 × 4 1 ⁶ / ₈	20 ¹ / ₂ × 4 1 ⁶ / ₈	21 × 4 1 ⁶ / ₈	21 × 4 1 ⁶ / ₈	21 ¹ / ₂ × 4 1 ⁶ / ₈	22 × 4 1 ⁶ / ₈	22 ¹ / ₂ × 4 1 ⁶ / ₈	23 × 4 1 ⁶ / ₈	23 ¹ / ₂ × 4 1 ⁶ / ₈	24 × 4 1 ⁶ / ₈	24 × 4 1 ⁶ / ₈	24 ¹ / ₂ × 4 1 ⁶ / ₈	25 × 4 1 ⁶ / ₈	25 ¹ / ₂ × 4 1 ⁶ / ₈	26 × 4 1 ⁶ / ₈	27 × 4 1 ⁶ / ₈	28 × 4 1 ⁶ / ₈	Sizes.	

MEM.—The Scantlings given in the above Table are intended for Vessels, the length of which does not exceed *eleven times* their depth from top of keel, see Section 1. For Vessels which exceed this proportion, see Section 46. For proportions of breadth to length, see Table G. 4.

Thickness of Plates	-	-	-	-	-	- -	$\frac{5}{16}$	$\frac{7}{16}$	$\frac{9}{16}$	$\frac{11}{16}^{\dagger}$	$\frac{12}{16}$	$\frac{13}{16}$	$\frac{14}{16}$	$\frac{15}{16}$	$\frac{16}{16}$	Rivets to be $\frac{1}{4}$ of an inch larger in diameter in the stem, stern-post and keel.
Diameter of rivets for the different thickness of plates	-	-	-	-	-	- -	$\frac{5}{8}$ of an Inch.	$\frac{3}{4}$ of an Inch.	$\frac{7}{8}$ of an Inch.	1 Inch.	13 Inches.	19 "				
Width of Butt Straps in double riveting for the respective rivets	-	-	-	-	-	- -	8 Inches.	$9\frac{3}{4}$ Inches.	$11\frac{1}{4}$ Inches.	16 $\frac{3}{4}$						
" " treble " " "	-	-	-	-	-	- -	$11\frac{3}{4}$ "	$14\frac{1}{4}$ "								

† Where stringer and tie plates are $\frac{1}{8}$ of an inch thick, they should be secured to the Beams with $\frac{3}{4}$ of an inch rivets.



IRON VESSELS.

TABLE G. 2.

TABLE OF MINIMUM DIMENSIONS OF KEELSONS, KEELSON AND STRINGER ANGLE IRONS, DECKS, RUDDERS, CEILING, AND WINDLASSES.

CEILING, AND WINDLASSES.															
NUMBERS. To regulate keelsons, stringers, decks, rudders, ceiling, and windlasses.	Size of middle-line keelsons standing upon floors, and thickness of rider plate to keelson for all grades.	Thickness of inter- costal keelson plates and side plates for box keel- sons, for all grades. **	Dimensions of angle irons on upper deck beam stringer plates in one and two-decked vessels, also for keelsons, and stringers in hold, for all grades.	Dimensions of angle irons on the middle, lower or hold, and orlop beam stringer plates, on upper deck stringer plates in three-decked vessels and on spar-deck stringer plates, also for box keelsons, for all grades.	RUDDER.				Thickness of upper deck, for all grades. * Wood.	Thick- ness of wood ceiling in hold, to upper part of bilges.	WINDLASS.				NUMBERS. To regulate keelsons, stringers, decks, rudders, ceiling, and windlasses.
					Sailing Vessels.		Steam Vessels.				Sailing Vessels.		Steam Vessels.		
					Diameter at the head.	Diameter at the heel.	Diameter at the head.	Diameter at the heel.			Diameter of iron spindle.	Diameter of main piece.	Diameter of iron spindle.	Diameter of main piece.	
2600 and under 3400	inches. $7\frac{1}{2} \times \frac{6}{16}$	inches. $\frac{4}{16}$	inches. $3 \times 3 \times \frac{6}{16}$	inches. $2\frac{3}{4} \times 2\frac{3}{4} \times \frac{6}{16}$	inches. $2\frac{7}{8}$	inches. 2	inches. 3	inches. 2	inches. $2\frac{1}{2}$	inches. 2	inches. $2\frac{1}{4}$	inches. $12\frac{1}{2}$	inches. 2	inches. 12	2600 and under 3400
3400 and under 5200	$8\frac{1}{2} \times \frac{7}{16}$	$\frac{5}{16}$	$3 \times 3 \times \frac{6}{16}$	$3 \times 3 \times \frac{6}{16}$	3	2	$3\frac{1}{2}$	2	3	2	$2\frac{1}{2}$	14	$2\frac{1}{4}$	13	3400 and under 5200
5200 and under 7200	$10 \times \frac{8}{16}$	$\frac{5}{16}$	$3 \times 3 \times \frac{6}{16}$	$3 \times 3 \times \frac{6}{16}$	$3\frac{1}{2}$	2	$3\frac{3}{4}$	$2\frac{1}{4}$	3	2	$2\frac{3}{4}$	15	$2\frac{1}{2}$	14	5200 and under 7200
7200 and under 8900	$11 \times \frac{9}{16}$	$\frac{6}{16}$	$3\frac{1}{2} \times 3 \times \frac{6}{16}$	$3 \times 3 \times \frac{6}{16}$	$3\frac{3}{4}$	$2\frac{1}{4}$	$4\frac{1}{4}$	$2\frac{1}{2}$	$3\frac{1}{2}$	$2\frac{1}{2}$	3	16	$2\frac{3}{4}$	15	7200 and under 8900
8900 and under 10450	$12 \times \frac{9}{16}$	$\frac{6}{16}$	$4 \times 3 \times \frac{6}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{6}{16}$	$4\frac{1}{4}$	$2\frac{1}{2}$	$4\frac{1}{2}$	$2\frac{3}{4}$	$3\frac{1}{2}$	$2\frac{1}{2}$	$3\frac{1}{4}$	17	$2\frac{3}{4}$	15	8900 and under 10450
10450 and under 11800	$12 \times \frac{10}{16}$	$\frac{7}{16}$	$4\frac{1}{2} \times 3 \times \frac{7}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$4\frac{1}{2}$	$2\frac{3}{4}$	$4\frac{3}{4}$	$2\frac{3}{4}$	$3\frac{1}{2}$	$2\frac{1}{2}$	$3\frac{1}{2}$	18	3	16	10450 and under 11800
11800 and under 13100	$13 \times \frac{10}{16}$	$\frac{7}{16}$	$4\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$	$4\frac{3}{4}$	$2\frac{3}{4}$	5	3	$3\frac{1}{2}$	$2\frac{1}{2}$	$3\frac{5}{8}$	19	$3\frac{1}{4}$	17	11800 and under 13100
13100 and under 14300	$14 \times \frac{11}{16}$	$\frac{7}{16}$	$5 \times 3\frac{1}{2} \times \frac{7}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	5	3	$5\frac{1}{4}$	3	$3\frac{1}{2}$	$2\frac{1}{2}$	$3\frac{3}{4}$	20	$3\frac{1}{4}$	17	13100 and under 14300
14300 and under 15500	$15 \times \frac{11}{16}$	$\frac{7}{16}$	$5 \times 3\frac{1}{2} \times \frac{8}{16}$	$3\frac{1}{2} \times 3\frac{1}{2} \times \frac{8}{16}$	$5\frac{1}{4}$	3	$5\frac{1}{2}$	3	$3\frac{1}{2}$	$2\frac{1}{2}$	4	21	$3\frac{1}{2}$	18	14300 and under 15500
15500 and under 16600	$16 \times \frac{12}{16}$	$\frac{8}{16}$	$5 \times 3\frac{1}{2} \times \frac{9}{16}$	$4 \times 4 \times \frac{8}{16}$	$5\frac{1}{2}$	3	$5\frac{3}{4}$	3	4	$2\frac{1}{2}$	$4\frac{1}{4}$	22	$3\frac{5}{8}$	19	15500 and under 16600
16600 and under 18700	$17 \times \frac{12}{16}$	$\frac{8}{16}$	$5 \times 4 \times \frac{9}{16}$	$4 \times 4 \times \frac{9}{16}$	6	3	$6\frac{1}{4}$	$3\frac{1}{4}$	4	$2\frac{1}{2}$	$4\frac{1}{2}$	23	$3\frac{5}{8}$	19	16600 and under 18700
18700 and under 21700	$18 \times \frac{13}{16}$	$\frac{8}{16}$	$5\frac{1}{2} \times 4 \times \frac{9}{16}$	$4 \times 4 \times \frac{9}{16}$	$6\frac{1}{4}$	$3\frac{1}{4}$	$6\frac{3}{4}$	$3\frac{1}{2}$	4	$2\frac{1}{2}$	$4\frac{5}{8}$	24	4	21	18700 and under 21700
21700 and under 26400	$19 \times \frac{13}{16}$	$\frac{9}{16}$	$6 \times 4 \times \frac{9}{16}$	$4 \times 4 \times \frac{9}{16}$	$6\frac{3}{4}$	$3\frac{1}{2}$	$7\frac{1}{2}$	$3\frac{3}{4}$	4	$2\frac{1}{2}$	$4\frac{5}{8}$	$25\frac{1}{2}$	$4\frac{1}{2}$	23	21700 and under 26400
26400 and under 30900	$21 \times \frac{14}{16}$	$\frac{9}{16}$	$6\frac{1}{2} \times 4 \times \frac{9}{16}$	$4 \times 4 \times \frac{9}{16}$	$7\frac{1}{2}$	$3\frac{3}{4}$	8	4	4	$2\frac{1}{2}$	$4\frac{3}{4}$	27	$4\frac{5}{8}$	24	26400 and under 30900
30900 and under 35200	$23 \times \frac{14}{16}$	$\frac{10}{16}$	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{9}{16}$	$4 \times 4 \times \frac{9}{16}$	8	4	$8\frac{1}{2}$	$4\frac{1}{2}$	4	$2\frac{1}{2}$	$4\frac{3}{4}$	$28\frac{1}{2}$	$4\frac{5}{8}$	$25\frac{1}{2}$	30900 and under 35200
35200 and under 40200	$26 \times \frac{14}{16}$	$\frac{10}{16}$	$6\frac{1}{2} \times 4\frac{1}{2} \times \frac{10}{16}$	$4 \times 4 \times \frac{9}{16}$	$8\frac{1}{2}$	$4\frac{1}{2}$	$9\frac{1}{4}$	$4\frac{3}{4}$	4	$2\frac{1}{2}$	5	30	$4\frac{3}{4}$	27	35200 and under 40200

**The top and bottom plates of box keelsons to be one-sixteenth of an inch more in thickness than the side plates.

MEM.—The Scantlings given in the above Table are intended for Vessels, the length of which does not exceed eleven times their depth from top of keel, see Section 1. For Vessels which exceed this proportion, see Section 46. For proportions of breadth to length, see Table G. 4.

* When the deck is of Teak, it may be one-sixth less in thickness. When of iron it is to be in thickness as per Table G. 4, but where an iron deck is substituted for a wood one, it is not to be less than $\frac{1}{8}$ ins.

DIAMETER OF NUT AND SCREW BOLTS FOR FASTENING FLAT OF DECK.

Deck under 3in. $\frac{3}{8}$ inch.
3in. and above $\frac{1}{2}$ "

Beans.

TABLE G 3.

*Lloyd's Register of Shipping,
London, 23rd March, 1876.*

Table of Minimum Dimensions of Stringer Plates, Iron Decks, and Tie Plates.

PLATING NUMBERS OF VESSELS	2000 to 3000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000	13000	14000	15000	16000	17000	18000	19000	20000	21000	22000	23000	24000	25000	27000	28000	29000	31000	32000	34000	35000	36000	38000	39000	40000	42000	PLATING NUMBERS OF VESSELS
Under 10 Depths, or Under 7 Breadths in Length.	20× ⁵ / ₁₆	20× ⁶ / ₁₆	23× ⁶ / ₁₆	26× ⁶ / ₁₆	28× ⁶ / ₁₆	28× ⁷ / ₁₆	30× ⁷ / ₁₆	32× ⁷ / ₁₆	32× ⁸ / ₁₆	34× ⁸ / ₁₆	36× ⁸ / ₁₆	36× ⁹ / ₁₆	40× ⁹ / ₁₆	42× ⁹ / ₁₆	42× ¹⁰ / ₁₆	44× ¹⁰ / ₁₆	46× ¹⁰ / ₁₆	48× ¹⁰ / ₁₆	50× ¹⁰ / ₁₆	52× ¹⁰ / ₁₆	54× ¹⁰ / ₁₆	56× ¹⁰ / ₁₆	59× ¹⁰ / ₁₆	62× ¹⁰ / ₁₆ Iron	60× ¹⁰ / ₁₆ deck for	62× ¹⁰ / ₁₆ half Length,	65× ¹⁰ / ₁₆ 1 ¹ / ₂ in. th	68× ¹⁰ / ₁₆ 1 ¹ / ₂ in. th	70× ¹⁰ / ₁₆ 1 ¹ / ₂ in. th	72× ¹⁰ / ₁₆ Complete	73× ¹⁰ / ₁₆ Ir. dk.	74× ¹⁰ / ₁₆ 1 ¹ / ₂ in. tk.	57× ¹⁰ / ₁₆ Complete Dk. for	58× ¹⁰ / ₁₆ Iron Up. 1 ¹ / ₂ len. b	59× ¹⁰ / ₁₆ Dk. & Ir. both 1 ¹ / ₂ tk.	60× ¹⁰ / ₁₆ on Mn. thick.	Under 10 Depths, or Under 7 Breadths in Length.
10 to 11 Depths, or 7 to 7½ Breadths.	22× ⁶ / ₁₆	22× ⁶ / ₁₆	25× ⁶ / ₁₆	28× ⁶ / ₁₆	31× ⁶ / ₁₆	32× ⁷ / ₁₆	34× ⁷ / ₁₆	36× ⁷ / ₁₆	36× ⁸ / ₁₆	38× ⁸ / ₁₆	40× ⁸ / ₁₆	40× ⁹ / ₁₆	44× ⁹ / ₁₆	46× ⁹ / ₁₆	46× ¹⁰ / ₁₆	48× ¹⁰ / ₁₆	50× ¹⁰ / ₁₆	52× ¹⁰ / ₁₆	54× ¹⁰ / ₁₆	56× ¹⁰ / ₁₆	58× ¹⁰ / ₁₆	60× ¹⁰ / ₁₆	58× ¹⁰ / ₁₆ Iron	61× ¹⁰ / ₁₆ deck for	63× ¹⁰ / ₁₆ half Length,	65× ¹⁰ / ₁₆ 1 ¹ / ₂ in. thick.	68× ¹⁰ / ₁₆ 1 ¹ / ₂ in. thick.	70× ¹⁰ / ₁₆ 1 ¹ / ₂ in. thick.	72× ¹⁰ / ₁₆ Complete	73× ¹⁰ / ₁₆ Iron d	74× ¹⁰ / ₁₆ 1 ¹ / ₂ of	75× ¹⁰ / ₁₆ 1 ¹ / ₂ in. thick.	57× ¹⁰ / ₁₆ Complete Mn. Dk. for	58× ¹⁰ / ₁₆ Ir. Up. 1 ¹ / ₂ len. b	59× ¹⁰ / ₁₆ Dk. & Ir. both 1 ¹ / ₂ tk.	60× ¹⁰ / ₁₆ Two Ir. Decks 1 ¹ / ₂ tk.	10 to 11 Depth or 7 to 7½ Breadths.
11 to 12 Depths, or 7½ to 8 Breadths.	24× ⁶ / ₁₆	25× ⁶ / ₁₆	28× ⁶ / ₁₆	31× ⁶ / ₁₆	34× ⁶ / ₁₆	36× ⁷ / ₁₆	38× ⁷ / ₁₆	40× ⁷ / ₁₆	40× ⁸ / ₁₆	42× ⁸ / ₁₆	44× ⁸ / ₁₆	44× ⁹ / ₁₆	48× ⁹ / ₁₆	50× ⁹ / ₁₆	50× ¹⁰ / ₁₆	52× ¹⁰ / ₁₆	54× ¹⁰ / ₁₆	56× ¹⁰ / ₁₆	58× ¹⁰ / ₁₆	60× ¹⁰ / ₁₆	62× ¹⁰ / ₁₆	60× ¹⁰ / ₁₆ Iron	62× ¹⁰ / ₁₆ deck for	64× ¹⁰ / ₁₆ half Length,	66× ¹⁰ / ₁₆ 1 ¹ / ₂ in. thick.	68× ¹⁰ / ₁₆ 1 ¹ / ₂ in. thick.	70× ¹⁰ / ₁₆ 1 ¹ / ₂ in. thick.	72× ¹⁰ / ₁₆ Complete	73× ¹⁰ / ₁₆ Iron d	74× ¹⁰ / ₁₆ 1 ¹ / ₂ of	75× ¹⁰ / ₁₆ 1 ¹ / ₂ in. thick.	56× ¹⁰ / ₁₆ Complete Main Dk.	57× ¹⁰ / ₁₆ Iron Up	58× ¹⁰ / ₁₆ per Deck, and	59× ¹⁰ / ₁₆ Iron and Iron 1 ¹ / ₂ tk.	60× ¹⁰ / ₁₆ Two Ir. Decks 1 ¹ / ₂ tk.	11 to 12 Depths, or 7½ to 8 Breadths.
12 to 13 Depths, or 8 to 8½ Breadths.	24× ⁶ / ₁₆	25× ⁷ / ₁₆	28× ⁷ / ₁₆	31× ⁷ / ₁₆	34× ⁷ / ₁₆	36× ⁸ / ₁₆	38× ⁸ / ₁₆	40× ⁸ / ₁₆	40× ⁹ / ₁₆	42× ⁹ / ₁₆	44× ⁹ / ₁₆	44× ¹⁰ / ₁₆	48× ¹⁰ / ₁₆	50× ¹⁰ / ₁₆	54× ¹⁰ / ₁₆	56× ¹⁰ / ₁₆	58× ¹⁰ / ₁₆	60× ¹⁰ / ₁₆	64× ¹⁰ / ₁₆	60× ¹⁰ / ₁₆ Iron	61× ¹⁰ / ₁₆ deck for	62× ¹⁰ / ₁₆ half Len	64× ¹⁰ / ₁₆ gth 1 ¹ / ₂ in. thi	66× ¹⁰ / ₁₆ 1 ¹ / ₂ in. thi	68× ¹⁰ / ₁₆ 1 ¹ / ₂ in. thi	70× ¹⁰ / ₁₆ 1 ¹ / ₂ in. thi	72× ¹⁰ / ₁₆ Complete	73× ¹⁰ / ₁₆ Iron deck	74× ¹⁰ / ₁₆ 1 ¹ / ₂ of an	75× ¹⁰ / ₁₆ 1 ¹ / ₂ in. thick.	56× ¹⁰ / ₁₆ Complete Main Dk.	57× ¹⁰ / ₁₆ Iron Up	58× ¹⁰ / ₁₆ per Deck, and	59× ¹⁰ / ₁₆ Iron and Iron 1 ¹ / ₂ tk.	60× ¹⁰ / ₁₆ Two Iron Decks 1 ¹ / ₂ in. thick.	12 to 13 Depths, or 8 to 8½ Breadths.	
13 to 14 Depths, or 8½ to 9 Breadths.	27× ⁶ / ₁₆	28× ⁷ / ₁₆	31× ⁷ / ₁₆	34× ⁷ / ₁₆	37× ⁷ / ₁₆	40× ⁸ / ₁₆	42× ⁸ / ₁₆	44× ⁸ / ₁₆	44× ⁹ / ₁₆	46× ⁹ / ₁₆	48× ⁹ / ₁₆	48× ¹⁰ / ₁₆	52× ¹⁰ / ₁₆	55× ¹⁰ / ₁₆	58× ¹⁰ / ₁₆	60× ¹⁰ / ₁₆	63× ¹⁰ / ₁₆	59× ¹⁰ / ₁₆ Iron	60× ¹⁰ / ₁₆ deck	61× ¹⁰ / ₁₆ for h	62× ¹⁰ / ₁₆ alf L	64× ¹⁰ / ₁₆ ength,	66× ¹⁰ / ₁₆ 1 ¹ / ₂ in. thi	68× ¹⁰ / ₁₆ 1 ¹ / ₂ in. thi	70× ¹⁰ / ₁₆ 1 ¹ / ₂ in. thi	72× ¹⁰ / ₁₆ Complete	73× ¹⁰ / ₁₆ Iron d	74× ¹⁰ / ₁₆ 1 ¹ / ₂ of	75× ¹⁰ / ₁₆ 1 ¹ / ₂ in. thick.	55× ¹⁰ / ₁₆ Complete Main Dk.	56× ¹⁰ / ₁₆ Iron Up	57× ¹⁰ / ₁₆ per Deck, and	58× ¹⁰ / ₁₆ Iron and Iron 1 ¹ / ₂ tk.	59× ¹⁰ / ₁₆ Two Iron	60× ¹⁰ / ₁₆ Decks 1 ¹ / ₂ in. thick.	61× ¹⁰ / ₁₆ in. thick.	13 to 14 Depths, or 8½ to 9 Breadths.
14 to 15 Depths, or 9 to 9½ Breadths.	30× ⁶ / ₁₆	31× ⁷ / ₁₆	31× ⁸ / ₁₆	34× ⁸ / ₁₆	37× ⁸ / ₁₆	40× ⁹ / ₁₆	42× ⁹ / ₁₆	44× ⁹ / ₁₆	44× ¹⁰ / ₁₆	46× ¹⁰ / ₁₆	48× ¹⁰ / ₁₆	52× ¹⁰ / ₁₆	56× ¹⁰ / ₁₆	60× ¹⁰ / ₁₆	63× ¹⁰ / ₁₆	58× ¹⁰ / ₁₆ Iron	59× ¹⁰ / ₁₆ deck	60× ¹⁰ / ₁₆ for half	61× ¹⁰ / ₁₆ Length,	62× ¹⁰ / ₁₆ 1 ¹ / ₂ of an	64× ¹⁰ / ₁₆ inch	66× ¹⁰ / ₁₆ inch	68× ¹⁰ / ₁₆ thick.	70× ¹⁰ / ₁₆ Complete	72× ¹⁰ / ₁₆ Iron d	73× ¹⁰ / ₁₆ 1 ¹ / ₂ of	74× ¹⁰ / ₁₆ an inch	75× ¹⁰ / ₁₆ thick.	55× ¹⁰ / ₁₆ Complete Main Dk.	56× ¹⁰ / ₁₆ Iron Up	57× ¹⁰ / ₁₆ per Deck, and	58× ¹⁰ / ₁₆ Iron and Iron 1 ¹ / ₂ tk.	59× ¹⁰ / ₁₆ Two Iron	60× ¹⁰ / ₁₆ on Decks 1 ¹ / ₂ in. thick.	61× ¹⁰ / ₁₆ in. thick.	62× ¹⁰ / ₁₆ in. thick.	14 to 15 Depths, or 9 to 9½ Breadths.
15 to 16 Depths, or 9½ to 10 Breadths.	33× ⁶ / ₁₆	34× ⁷ / ₁₆	34× ⁸ / ₁₆	38× ⁸ / ₁₆	40× ⁹ / ₁₆	44× ⁹ / ₁₆	46× ⁹ / ₁₆	48× ⁹ / ₁₆	48× ¹⁰ / ₁₆	50× ¹⁰ / ₁₆	52× ¹⁰ / ₁₆	56× ¹⁰ / ₁₆	60× ¹⁰ / ₁₆	57× ¹⁰ / ₁₆ Iron	58× ¹⁰ / ₁₆ deck	59× ¹⁰ / ₁₆ for half	60× ¹⁰ / ₁₆ Length,	61× ¹⁰ / ₁₆ 1 ¹ / ₂ in	62× ¹⁰ / ₁₆ 1 ¹ / ₂ in	64× ¹⁰ / ₁₆ ch th	66× ¹⁰ / ₁₆ ch th	68× ¹⁰ / ₁₆ thick.	70× ¹⁰ / ₁₆ Complete	72× ¹⁰ / ₁₆ Iron d	73× ¹⁰ / ₁₆ 1 ¹ / ₂ of	74× ¹⁰ / ₁₆ an inch	75× ¹⁰ / ₁₆ thick.	54× ¹⁰ / ₁₆ Complete Main Dk.	55× ¹⁰ / ₁₆ Iron Up	56× ¹⁰ / ₁₆ per Deck, and	57× ¹⁰ / ₁₆ Iron and Iron 1 ¹ / ₂ tk.	58× ¹⁰ / ₁₆ Two	59× ¹⁰ / ₁₆ Iron	60× ¹⁰ / ₁₆ Decks 1 ¹ / ₂ in. thick.	61× ¹⁰ / ₁₆ in. thick.	62× ¹⁰ / ₁₆ in. thick.	15 to 16 Depths, or 9½ to 10 Breadths.
16 to 17 Depths, or 10 to 10½ Breadths.	—	—	—	—	—	—	—	49× ⁹ / ₁₆ Iron	51× ¹⁰ / ₁₆ deck	53× ¹⁰ / ₁₆ for	54× ¹⁰ / ₁₆ half	56× ¹⁰ / ₁₆ Length,	57× ¹⁰ / ₁₆ 1 ¹ / ₂ of an	58× ¹⁰ / ₁₆ 1 ¹ / ₂ in	60× ¹⁰ / ₁₆ inch	61× ¹⁰ / ₁₆ inch	62× ¹⁰ / ₁₆ thick.	64× ¹⁰ / ₁₆ thick.	66× ¹⁰ / ₁₆ Complete	68× ¹⁰ / ₁₆ Iron	70× ¹⁰ / ₁₆ deck	72× ¹⁰ / ₁₆ 1 ¹ / ₂ of	74× ¹⁰ / ₁₆ an inch	75× ¹⁰ / ₁₆ thick.	53× ¹⁰ / ₁₆ Complete	54× ¹⁰ / ₁₆ Iron	55× ¹⁰ / ₁₆ Upper	56× ¹⁰ / ₁₆ Deck, and	57× ¹⁰ / ₁₆ Iron	58× ¹⁰ / ₁₆ Two	59× ¹⁰ / ₁₆ Iron	60× ¹⁰ / ₁₆ Decks 1 ¹ / ₂ of	61× ¹⁰ / ₁₆ an in.	63× ¹⁰ / ₁₆ an in.	63× ¹⁰ / ₁₆ thick.	16 to 17 Depths, or 10 to 10½ Breadths.	
Over 17 Depths, or Over 10½ Breadths.	—	—	—	—	—	—	—	—	—	54× ¹⁰ / ₁₆ Iron	56× ¹⁰ / ₁₆ deck	57× ¹⁰ / ₁₆ for	58× ¹⁰ / ₁₆ half	59× ¹⁰ / ₁₆ Length,	60× ¹⁰ / ₁₆ 1 ¹ / ₂ in.	61× ¹⁰ / ₁₆ thick.	62× ¹⁰ / ₁₆ thick.	64× ¹⁰ / ₁₆ Complete	66× ¹⁰ / ₁₆ Iron	68× ¹⁰ / ₁₆ deck	70× ¹⁰ / ₁₆ 1 ¹ / ₂ of an	73× ¹⁰ / ₁₆ an inch	75× ¹⁰ / ₁₆ thick.	52× ¹⁰ / ₁₆ Complete	53× ¹⁰ / ₁₆ Iron	54× ¹⁰ / ₁₆ Upper	55× ¹⁰ / ₁₆ per Deck, and	56× ¹⁰ / ₁₆ Iron	57× ¹⁰ / ₁₆ Main	58× ¹⁰ / ₁₆ Two	59× ¹⁰ / ₁₆ Iron	60× ¹⁰ / ₁₆ Decks both	61× ¹⁰ / ₁₆ 1 ¹ / ₂ of	62× ¹⁰ / ₁₆ of	63× ¹⁰ / ₁₆ an in.	64× ¹⁰ / ₁₆ thick.	Over 17 Depths, or Over 10½ Breadths.
Ends of Main Stringer Plates.	—	—	15× ⁶ / ₁₆	17× ⁶ / ₁₆	19× ⁶ / ₁₆	19× ⁶ / ₁₆	20× ⁶ / ₁₆	22× ⁶ / ₁₆	22× ⁷ / ₁₆	23× ⁷ / ₁₆	24× ⁷ / ₁₆	24× ⁸ / ₁₆	26× ⁸ / ₁₆	28× ⁸ / ₁₆	28× ⁹ / ₁₆	29× ⁹ / ₁₆	30× ⁹ / ₁₆	31× ⁹ / ₁₆	32× ⁹ / ₁₆	33× ⁹ / ₁₆	35× ⁹ / ₁₆	36× ⁹ / ₁₆	36× ¹⁰ / ₁₆	37× ¹⁰ / ₁₆	38× ¹⁰ / ₁₆	40× ¹⁰ / ₁₆	41× ¹⁰ / ₁₆	42× ¹⁰ / ₁₆	43× ¹⁰ / ₁₆	44× ¹⁰ / ₁₆	45× ¹⁰ / ₁₆	45× ⁹ / ₁₆	46× ⁹ / ₁₆	47× ⁹ / ₁₆	48× ⁹ / ₁₆	49× ⁹ / ₁₆	Ends of Main Stringer Plates.
Hold Beam Stringer Plates (extreme breadth) Ends of ditto.	—	—	—	—	—	20× ⁶ / ₁₆	21× ⁶ / ₁₆	22× ⁶ / ₁₆	23× ⁷ / ₁₆	25× ⁷ / ₁₆	27× ⁷ / ₁₆	28× ⁸ / ₁₆	29× ⁸ / ₁₆	30× ⁸ / ₁₆	31× ⁸ / ₁₆	32× ⁸ / ₁₆	33× ⁸ / ₁₆	34× ⁸ / ₁₆	35× ⁸ / ₁₆	37× ⁸ / ₁₆	38× ⁸ / ₁₆	39× ⁸ / ₁₆	40× ⁸ / ₁₆	41× ⁸ / ₁₆	42× ⁸ / ₁₆	43× ⁸ / ₁₆	44× ⁸ / ₁₆	45× ⁸ / ₁₆	46× ⁸ / ₁₆	47× ⁸ / ₁₆	48× ⁸ / ₁₆	50× ⁸ / ₁₆	51× ⁸ / ₁₆	52× ⁸ / ₁₆	53× ⁸ / ₁₆	54× ⁸ / ₁₆	Hold Beam Stringer Plates (extreme breadth) Ends of ditto.
Tie Plates on Beams, Fore-and-Aft, and Diagonal.	—	—	7× ⁶ / ₁₆	7× ⁶ / ₁₆	7× ⁶ / ₁₆	8× ⁷ / ₁₆	8× ⁷ / ₁₆	9× ⁷ / ₁₆	9× ⁸ / ₁₆	10× ⁸ / ₁₆	10× ⁸ / ₁₆	10× ⁹ / ₁₆	11× ⁹ / ₁₆	12× ⁹ / ₁₆	12× ¹⁰ / ₁₆	13× ¹⁰ / ₁₆	13× ¹⁰ / ₁₆	13× ¹⁰ / ₁₆	14× ¹⁰ / ₁₆	14× ¹⁰ / ₁₆	15× ¹⁰ / ₁₆	15× ¹⁰ / ₁₆	15× ¹⁰ / ₁₆	16× ¹⁰ / ₁₆	16× ¹⁰ / ₁₆	17× ¹⁰ / ₁₆	17× ¹⁰ / ₁₆	18× ¹⁰ / ₁₆	18× ¹⁰ / ₁₆	19× ¹⁰ / ₁₆	19× ¹⁰ / ₁₆	20× ¹⁰ / ₁₆	20× ¹⁰ / ₁₆	21× ¹⁰ / ₁₆	21× ¹⁰ / ₁₆	22× ¹⁰ / ₁₆	Tie Plates on Beams, Fore-and-Aft, and Diagonal.

The depths for proportions to be taken from upper side of keel to top of upper deck beams in one, two, and three deck ships, and to top of main deck in spar and awning deck vessels; and, in spar-decked vessels, one depth may be taken off the proportions, so that in a spar-decked vessel of twelve and under thirteen depths in length, the stringers, &c., may be of the sizes given in the above Table for vessels of eleven and under twelve depths in length; and so on.

In two decked vessels the main stringer plates given in the above Table are to be fitted to the upper deck beams.

In three decked vessels the main stringer and tie plates given in the above Table are to be fitted to the middle deck beams, and the stringer and tie plates required for the upper deck beams are to be of the same width as those given in the Table, but they may be one-sixteenth of an inch less in thickness.

In spar decked vessels the main stringer and tie plates given in the above Table are to be fitted to the main deck beams; and the stringer and tie plates required for the spar deck beams are to be the breadth of, and may be two-sixteenths of an inch less in thickness than the stringer plates given on the upper line of the Table for vessels of the same plating number, and may be reduced at their ends to seven-sixteenths of an inch thick and to the breadth given for the ends of the main deck stringer plate in the Table.

All stringer plates are to maintain the midship breadth for one-half the vessel's length amidships, from thence the breadth may be gradually reduced to that given above for the ends of the vessel.

Where a reduction of two-sixteenths of an inch from the midship thickness is allowed for the ends, the stringer plates may be reduced one-sixteenth of an inch in thickness for one-eighth of the vessel's length before and abaft the half length amidships, and from thence to the ends they may be reduced another sixteenth of an inch in the thickness.

In awning decked vessels the main stringer and plates given in the above Table are to be fitted to the main deck beams, and the stringer plates required for the awning deck beams to be of the same width as those given in the Table for hold beam stringer plates, and to be six-sixteenths of an inch in thickness where the plating number is under 14000, and seven-sixteenths of an inch where the plating number is 14000 or above.

Where there is an iron deck prescribed either for the length of the vessel, or for half the length amidships, it is to be fitted to the upper deck beams in two decked vessels. In decked vessels and spar-decked vessels it may be fitted either to the upper or middle deck beams.

In way of an iron deck or half-iron deck, the stringer plates may be reduced in width to one inch for every seven feet of the length of the vessel, but the thickness is to be as given above. Where more than one iron deck is required the stringer plates are to be of the breadth and thickness given in the Table.

Where an iron deck is prescribed in the Table to be fitted for one-half the vessel's length amidships, it is to be maintained the full breadth of the vessel for that length, and then tapered gradually into the stringer plates for one-eighth the vessel's length at each end.

Where diagonal tie plates are to be fitted on the beams in sufficient number, and to the satisfaction of the Surveyor, their breadth as given in the Table may be deducted from the breadth given above for the stringer plates amidships, in which case the stringer plates may be reduced in breadth at the ends of the vessel to three-fourths of their breadth amidships.

Orlop stringer plates where required to be fitted, to be of the same thickness as the hold beam stringer plates, and three-fourths the breadth of the same.

WOLY KE 22334

Suggested SIZES AND SCANTLINGS FOR YARDS AND TOPMASTS OF FULL RIGGED STEAM VESSELS AND SAILING VESSELS.

IRON YARDS, Without Angle Irons.										IRON TOPMASTS, Without Angle Irons.									
LENGTH.	CENTRE.		1st Quarter.		2nd Quarter.		3rd Quarter.		ENDS.		LENGTH.	HEEL.		Lower part of Head.		HEAD.			
	Diam-eter.	Thick-ness.	Diam-eter.	Thick-ness.	Diam-eter.	Thick-ness.	Diam-eter.	Thick-ness.	Diam-eter.	Thick-ness.		Diam-eter.	Thick-ness.	Diam-eter.	Thick-ness.	Diam-eter.	Thick-ness.		
32	8	$\frac{3}{16}$	$7\frac{7}{8}$	$\frac{3}{16}$	$7\frac{1}{4}$	$\frac{3}{16}$	6	$\frac{3}{16}$	4	$\frac{2}{16}$	32	$11\frac{1}{2}$	$\frac{3}{16}$	$7\frac{1}{4}$	$\frac{3}{16}$	$6\frac{1}{2}$	$\frac{2}{16}$		
36	9	$\frac{3}{16}$	$8\frac{3}{4}$	$\frac{3}{16}$	$8\frac{1}{8}$	$\frac{3}{16}$	$6\frac{3}{4}$	$\frac{3}{16}$	$4\frac{1}{2}$	$\frac{2}{16}$	34	$12\frac{1}{4}$	$\frac{3}{16}$	8	$\frac{3}{16}$	$6\frac{3}{4}$	$\frac{2}{16}$		
40	10	$\frac{3}{16}$	$9\frac{3}{4}$	$\frac{3}{16}$	9	$\frac{3}{16}$	$7\frac{1}{2}$	$\frac{3}{16}$	5	$\frac{2}{16}$	36	$12\frac{3}{4}$	$\frac{4}{16}$	9	$\frac{4}{16}$	7	$\frac{3}{16}$		
44	11	$\frac{3}{16}$	$10\frac{3}{4}$	$\frac{3}{16}$	10	$\frac{3}{16}$	$8\frac{1}{4}$	$\frac{3}{16}$	$5\frac{1}{2}$	$\frac{2}{16}$	38	$13\frac{1}{2}$	$\frac{4}{16}$	10	$\frac{4}{16}$	$7\frac{1}{2}$	$\frac{3}{16}$		
48	12	$\frac{4}{16}$	$11\frac{3}{4}$	$\frac{4}{16}$	$10\frac{3}{4}$	$\frac{3}{16}$	9	$\frac{3}{16}$	6	$\frac{2}{16}$	40	$14\frac{1}{2}$	$\frac{4}{16}$	11	$\frac{4}{16}$	8	$\frac{3}{16}$		
52	13	$\frac{4}{16}$	$12\frac{3}{8}$	$\frac{4}{16}$	$11\frac{3}{4}$	$\frac{3}{16}$	$9\frac{3}{4}$	$\frac{3}{16}$	$6\frac{1}{2}$	$\frac{2}{16}$	42	15	$\frac{4}{16}$	11	$\frac{4}{16}$	$8\frac{1}{4}$	$\frac{3}{16}$		
56	14	$\frac{4}{16}$	$13\frac{3}{8}$	$\frac{4}{16}$	$12\frac{5}{8}$	$\frac{4}{16}$	$10\frac{1}{2}$	$\frac{3}{16}$	7	$\frac{2}{16}$	44	$15\frac{3}{4}$	$\frac{4}{16}$	12	$\frac{4}{16}$	$8\frac{3}{4}$	$\frac{3}{16}$		
60	15	$\frac{4}{16}$	$14\frac{3}{8}$	$\frac{4}{16}$	$13\frac{1}{2}$	$\frac{4}{16}$	$11\frac{1}{4}$	$\frac{3}{16}$	$7\frac{1}{2}$	$\frac{2}{16}$	46	$16\frac{1}{2}$	$\frac{5}{16}$	12	$\frac{4}{16}$	9	$\frac{4}{16}$		
64	16	$\frac{5}{16}$	$15\frac{5}{8}$	$\frac{5}{16}$	$14\frac{3}{8}$	$\frac{5}{16}$	12	$\frac{4}{16}$	8	$\frac{3}{16}$	48	$17\frac{1}{2}$	$\frac{5}{16}$	13	$\frac{4}{16}$	$9\frac{1}{2}$	$\frac{4}{16}$		
68	17	$\frac{5}{16}$	$16\frac{1}{2}$	$\frac{5}{16}$	$15\frac{1}{4}$	$\frac{5}{16}$	$12\frac{3}{4}$	$\frac{4}{16}$	$8\frac{1}{2}$	$\frac{3}{16}$	50	$18\frac{1}{4}$	$\frac{5}{16}$	13	$\frac{4}{16}$	10	$\frac{4}{16}$		
72	18	$\frac{5}{16}$	$17\frac{1}{2}$	$\frac{5}{16}$	$16\frac{1}{4}$	$\frac{5}{16}$	$13\frac{1}{2}$	$\frac{4}{16}$	9	$\frac{3}{16}$	52	19	$\frac{5}{16}$	14	$\frac{5}{16}$	$10\frac{1}{2}$	$\frac{5}{16}$		
76	19	$\frac{6}{16}$	$18\frac{1}{2}$	$\frac{6}{16}$	$17\frac{1}{8}$	$\frac{6}{16}$	$14\frac{1}{4}$	$\frac{4}{16}$	$9\frac{1}{2}$	$\frac{3}{16}$	54	$19\frac{3}{4}$	$\frac{6}{16}$	14	$\frac{5}{16}$	11	$\frac{5}{16}$		
80	20	$\frac{6}{16}$	$19\frac{1}{2}$	$\frac{6}{16}$	18	$\frac{6}{16}$	15	$\frac{4}{16}$	10	$\frac{3}{16}$	56	$20\frac{1}{2}$	$\frac{6}{16}$	15	$\frac{5}{16}$	$11\frac{1}{2}$	$\frac{5}{16}$		
84	21	$\frac{7}{16}$	$20\frac{1}{2}$	$\frac{6}{16}$	19	$\frac{6}{16}$	$15\frac{3}{4}$	$\frac{5}{16}$	$10\frac{1}{2}$	$\frac{4}{16}$	58	21	$\frac{6}{16}$	15	$\frac{5}{16}$	$11\frac{3}{4}$	$\frac{5}{16}$		
88	22	$\frac{7}{16}$	$21\frac{1}{2}$	$\frac{6}{16}$	$19\frac{3}{4}$	$\frac{6}{16}$	$16\frac{1}{2}$	$\frac{5}{16}$	11	$\frac{4}{16}$	60	22	$\frac{6}{16}$	16	$\frac{5}{16}$	$12\frac{1}{4}$	$\frac{5}{16}$		
92	23	$\frac{7}{16}$	$22\frac{1}{2}$	$\frac{6}{16}$	$20\frac{3}{4}$	$\frac{6}{16}$	$17\frac{1}{4}$	$\frac{5}{16}$	$11\frac{1}{2}$	$\frac{4}{16}$	62	$22\frac{3}{4}$	$\frac{6}{16}$	16	$\frac{5}{16}$	$12\frac{3}{4}$	$\frac{5}{16}$		
96	24	$\frac{7}{16}$	$23\frac{3}{8}$	$\frac{6}{16}$	$21\frac{5}{8}$	$\frac{6}{16}$	18	$\frac{5}{16}$	12	$\frac{4}{16}$	64	$23\frac{1}{2}$	$\frac{6}{16}$	17	$\frac{5}{16}$	13	$\frac{5}{16}$		

Where Steamers are intended to be fitted with topmasts or yards for auxiliary purposes, they might be one-eighth less in diameter than prescribed by Table.

TOPMASTS (WITHOUT ANGLE IRONS).—The plating should be of the thickness given in the Table. The seams of topmasts might be single riveted; the butts should be treble riveted, and their straps one-sixteenth of an inch thicker than the plates they connect. There should be doubling plates in the way of the lower mast cap. Topmasts should be efficiently strengthened in the way of the fid holes and in way of sheave holes where such are cut, by doubling plates, iron hoops, or by other approved methods.

LOWER YARDS (WITHOUT ANGLE IRONS).—The plating should be of the thickness given in the Table. The seams of yards might be single riveted; their butts should be treble riveted, and connected by being overlapped, or by efficient butt straps. The plates should be doubled at the centre, and the doubling plates should extend beyond the truss hoops.

MASTS AND YARDS (CONSTRUCTED WITH ANGLE IRONS).—When masts, or yards are constructed with angle irons, they should be properly shifted, and should extend the whole length of the mast. If the plates be arranged as suggested in the Tables, there should be an angle iron fitted to each plate in the round; the sum of the flanges of each of these angle irons should not be less than one-fourth the diameter of the mast or yard in inches, and the thickness of each flange should be one-sixteenth of an inch for every inch in width of their two sides. If these angle irons be fitted, the plating might be one-sixteenth of an inch less in thickness than prescribed by Tables; the seams might be single riveted, and the butts double riveted, excepting that the butts of two lengths of plates above or outside the wedging should be treble riveted.

[SEE OTHER SIDE.]

Suggested SIZES AND SCANTLINGS FOR MASTS AND BOWSPRITS OF FULL RIGGED STEAM VESSELS AND SAILING VESSELS.

IRON MASTS, Without Angle Irons.

LENGTH.	PARTNERS.		HEEL.		HOUNDS.		HEAD.		CHEEKS.	
	Diam-eter.	Thick-ness.	Diam-eter.	Thick-ness.	Diam-eter.	Thick-ness.	Diam-eter.	Thick-ness.	Thick-ness of Plate.	Sizes of Angle Iron.
48	17	$\frac{5}{16}$	13	$\frac{4}{16}$	$13\frac{1}{2}$	$\frac{4}{16}$	$11\frac{1}{2}$	$\frac{3}{16}$	$\frac{7}{16}$	$3\frac{1}{2} \times 2\frac{1}{2} \times \frac{6}{16}$
51	18	$\frac{5}{16}$	$13\frac{1}{2}$	$\frac{4}{16}$	14	$\frac{4}{16}$	12	$\frac{4}{16}$	$\frac{7}{16}$	$3\frac{1}{2} \times 3 \times \frac{6}{16}$
54	19	$\frac{5}{16}$	14	$\frac{4}{16}$	15	$\frac{4}{16}$	13	$\frac{4}{16}$	$\frac{7}{16}$	$3\frac{1}{2} \times 3 \times \frac{6}{16}$
57	20	$\frac{6}{16}$	15	$\frac{5}{16}$	16	$\frac{5}{16}$	$13\frac{1}{2}$	$\frac{4}{16}$	$\frac{8}{16}$	$4 \times 3 \times \frac{7}{16}$
60	21	$\frac{6}{16}$	16	$\frac{5}{16}$	17	$\frac{5}{16}$	14	$\frac{5}{16}$	$\frac{8}{16}$	$4 \times 3 \times \frac{7}{16}$
63	22	$\frac{6}{16}$	$16\frac{1}{2}$	$\frac{5}{16}$	18	$\frac{5}{16}$	15	$\frac{5}{16}$	$\frac{8}{16}$	$4 \times 3 \times \frac{7}{16}$
66	23	$\frac{6}{16}$	17	$\frac{5}{16}$	$18\frac{1}{2}$	$\frac{5}{16}$	$15\frac{1}{2}$	$\frac{5}{16}$	$\frac{8}{16}$	$4\frac{1}{2} \times 3 \times \frac{7}{16}$
69	$24\frac{1}{2}$	$\frac{6}{16}$	18	$\frac{5}{16}$	19	$\frac{5}{16}$	16	$\frac{5}{16}$	$\frac{8}{16}$	$4\frac{1}{2} \times 3 \times \frac{7}{16}$
72	26	$\frac{6}{16}$	19	$\frac{5}{16}$	20	$\frac{5}{16}$	17	$\frac{5}{16}$	$\frac{8}{16}$	$4\frac{1}{2} \times 3 \times \frac{7}{16}$
75	27	$\frac{7}{16}$	$19\frac{1}{2}$	$\frac{6}{16}$	21	$\frac{6}{16}$	$17\frac{1}{2}$	$\frac{6}{16}$	$\frac{9}{16}$	$4\frac{1}{2} \times 3 \times \frac{8}{16}$
78	28	$\frac{7}{16}$	20	$\frac{6}{16}$	22	$\frac{6}{16}$	18	$\frac{6}{16}$	$\frac{9}{16}$	$4\frac{1}{2} \times 3 \times \frac{8}{16}$
81	29	$\frac{7}{16}$	21	$\frac{6}{16}$	$22\frac{1}{2}$	$\frac{6}{16}$	19	$\frac{6}{16}$	$\frac{9}{16}$	$5 \times 3\frac{1}{2} \times \frac{9}{16}$
84	30	$\frac{8}{16}$	22	$\frac{6}{16}$	23	$\frac{6}{16}$	$19\frac{1}{2}$	$\frac{6}{16}$	$\frac{10}{16}$	$5 \times 3\frac{1}{2} \times \frac{9}{16}$
87	31	$\frac{8}{16}$	$22\frac{1}{2}$	$\frac{6}{16}$	24	$\frac{6}{16}$	20	$\frac{6}{16}$	$\frac{10}{16}$	$5\frac{1}{2} \times 4 \times \frac{10}{16}$
90	32	$\frac{8}{16}$	23	$\frac{7}{16}$	25	$\frac{7}{16}$	21	$\frac{6}{16}$	$\frac{10}{16}$	$6 \times 4 \times \frac{10}{16}$
93	33	$\frac{9}{16}$	24	$\frac{7}{16}$	26	$\frac{7}{16}$	$21\frac{1}{2}$	$\frac{6}{16}$	$\frac{11}{16}$	$6 \times 4 \times \frac{10}{16}$
96	34	$\frac{9}{16}$	25	$\frac{7}{16}$	$26\frac{1}{2}$	$\frac{7}{16}$	22	$\frac{6}{16}$	$\frac{11}{16}$	$6 \times 4 \times \frac{10}{16}$

IRON BOWSPRITS, Without Angle Irons.

LENGTH OUTSIDE BED.	BED.		HEEL.		CAP.	
	Diam-eter.	Thick-ness.	Diam-eter.	Thick-ness.	Diam-eter.	Thick-ness.
14	$17\frac{1}{2}$	$\frac{5}{16}$	$14\frac{1}{2}$	$\frac{5}{16}$	12	$\frac{4}{16}$
15	$18\frac{1}{2}$	$\frac{5}{16}$	$15\frac{1}{2}$	$\frac{5}{16}$	$12\frac{1}{2}$	$\frac{5}{16}$
16	20	$\frac{5}{16}$	$16\frac{1}{2}$	$\frac{5}{16}$	13	$\frac{5}{16}$
17	$21\frac{1}{2}$	$\frac{6}{16}$	18	$\frac{6}{16}$	14	$\frac{5}{16}$
18	23	$\frac{6}{16}$	19	$\frac{6}{16}$	15	$\frac{5}{16}$
19	$24\frac{1}{2}$	$\frac{6}{16}$	20	$\frac{6}{16}$	16	$\frac{5}{16}$
20	26	$\frac{7}{16}$	21	$\frac{6}{16}$	$16\frac{1}{2}$	$\frac{6}{16}$
21	27	$\frac{7}{16}$	22	$\frac{6}{16}$	$17\frac{1}{2}$	$\frac{6}{16}$
22	28	$\frac{7}{16}$	23	$\frac{6}{16}$	$18\frac{1}{2}$	$\frac{6}{16}$
23	30	$\frac{8}{16}$	24	$\frac{7}{16}$	19	$\frac{6}{16}$
24	31	$\frac{8}{16}$	25	$\frac{7}{16}$	20	$\frac{6}{16}$
25	32	$\frac{8}{16}$	26	$\frac{7}{16}$	21	$\frac{6}{16}$
26	33	$\frac{8}{16}$	27	$\frac{7}{16}$	$21\frac{1}{2}$	$\frac{6}{16}$
27	35	$\frac{8}{16}$	28	$\frac{7}{16}$	22	$\frac{6}{16}$

Where Steamers are intended to be fitted with masts or a bowsprit for auxiliary purposes, they might be one-eighth less in diameter than prescribed by Table.

SUGGESTIONS FOR THE CONSTRUCTION OF IRON MASTS, BOWSPRITS, AND YARDS.—The Iron used in the construction of Masts, Bowsprits, and Yards, should be of good malleable quality, and quite free from surface or other defects.

LOWER MASTS (WITHOUT ANGLE IRONS).—The plating should be of the thickness, and the plates arranged as suggested in Table. The seams should be double riveted. The butts below the mast partners in masts, and those inside the wedging of bowsprits, might be double riveted, and remainder should be treble riveted. The butt straps in all cases should be one-sixteenth of an inch thicker than the plates they connect, and would be better to be fitted on the outside of the mast or bowsprit. The mast and bowsprit plates should be doubled in way of the wedging, or otherwise efficiently strengthened. The heels of all masts and their steps should be efficiently strengthened.

All Bowsprits exceeding 28 inches in diameter should have a vertical diaphragm plate extending from within the wedging to the Gunmoning, connected by single angle iron to the upper and lower parts of the bowsprit, and two additional angle irons of the size required for masts; and bowsprits, 28 inches in diameter and under, to have an angle iron at the centre of each plate extending the whole length of the bowsprit.

Sketches of SKEEL masts, bowsprits, and yards to be submitted for the approval of the Committee. The cheeks of masts should be ship, material, and sizes of the same being efficient.

The attention of the Surveyors is to be especially directed to the fittings connected with the masts and rigging, in order to ensure the workman-

[SEE OTHER SIDE.]

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